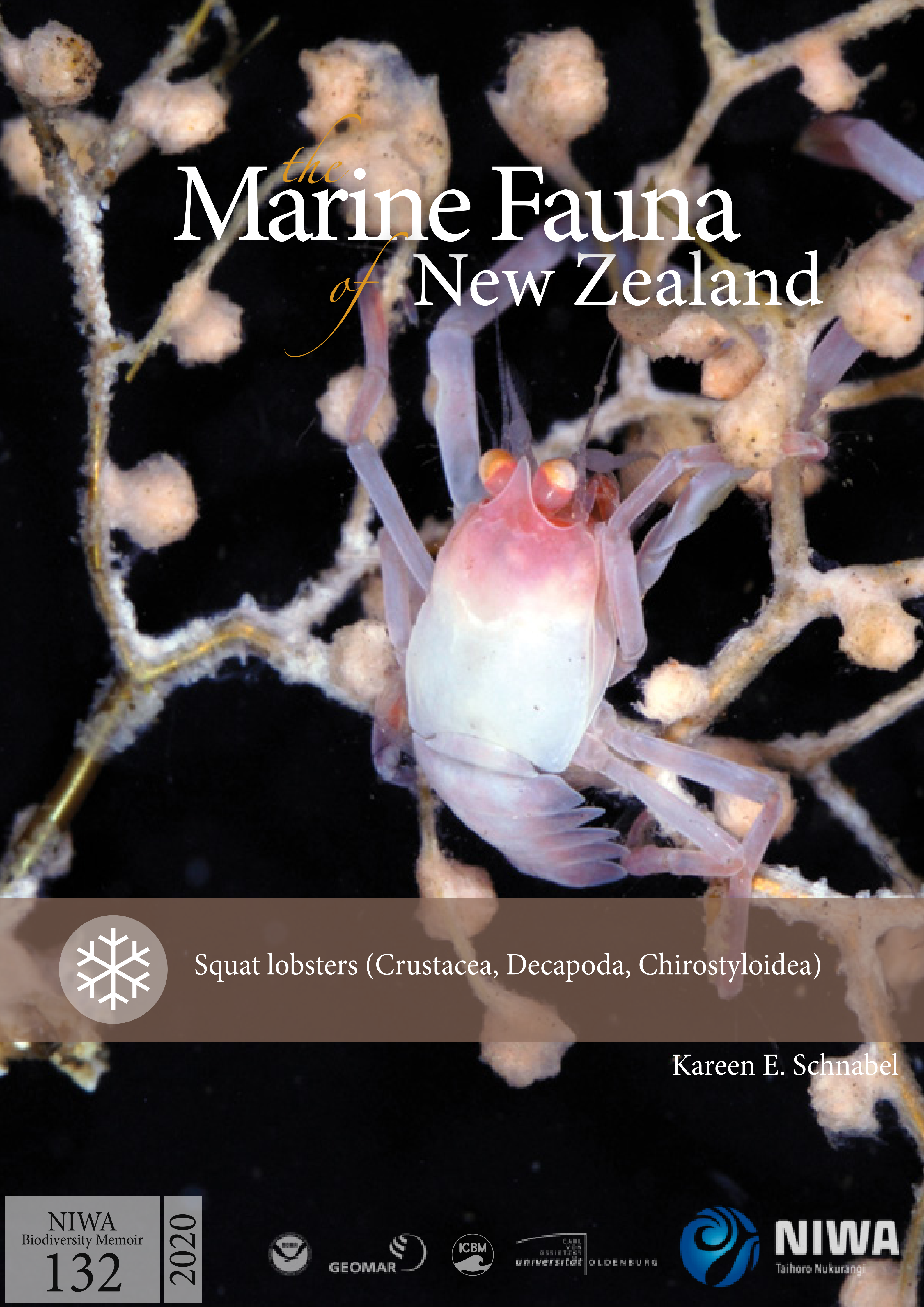

the Marine Fauna *of* New Zealand

Squat lobsters (Crustacea, Decapoda, Chirostyloidea)

Kareen E. Schnabel

NIWA Biodiversity Memoir 132

2020

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Cataloguing in Publication

SCHNABEL, K.E.
The Marine Fauna of New Zealand. Squat lobsters (Crustacea, Decapoda, Chirostyloidea) / by Kareen E. Schnabel—Wellington: NIWA (National Institute of Water and Atmospheric Research), 2020 (NIWA Biodiversity Memoir, ISSN 1174-0043; 132)

Soft cover	ISBN 978–0–473–52183–7
Hard cover	ISBN 978–0–473–52184–4
Electronic	ISBN 978–0–473–52185–1

Series and Managing Editor Michelle Kelly, NIWA
Technical Editor Sadie Mills, NIWA
Copy edited, typeset and indexed by Geoff Gregory, Word Therapy, Paraparaumu
Series Design by TCMedia Ltd
Printed and bound by Graphic Press & Packaging Ltd, Levin

Accepted for publication by Michelle Kelly & Sadie Mills, 31 March 2020, published 30 June 2020

Special thanks to our international contributors

Cover image
Close up image of *Uroptychus bispinatus* Baba, 1988 (NIWA 72233) on a specimen of *Chrysogorgia* coral. This beautiful squat lobster was collected from the south cone of Clark Seamount between 1456 m and 1460 m. Image courtesy of Rob Stewart, NIWA.

ISSN 1174-0043; 132 (print edition)

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Close up image of what is thought to be *Chirostylus dolichopus*, perched on a gorgonian coral fan, photographed by Clinton Duffy at Meyer Island, Kermadec Islands, at a depth of about 20–30 m.

PREFACE

Squat lobsters (Crustacea, Decapoda, Chirostyloidea)

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Abstract

Marine squat lobsters belonging to the two superfamilies, Galatheoidea Samouelle, 1819 and Chirostyloidea Ortmann, 1892, are conspicuous elements of marine environments at most latitudes and depths. Current global diversity estimates stand at around 1300 species of galatheoids and 345 chirostyloids. The rate of discovery has not decreased in recent years; a recent book on squat lobster biology highlighted gaps in regional inventories of species, citing the New Zealand region as an example.

All species of superfamily Chirostyloidea of the New Zealand Exclusive Economic Zone (EEZ) are reviewed and inventoried from new and historical collections and revised where necessary. Collections within the National Institute of Water and Atmospheric Research (NIWA) Invertebrate Collection (NIC), the Museum of New Zealand Te Papa Tongarewa (NMNZ), Auckland War Memorial Museum Tāmaki Paenga Hira (AKM), and the Australian Museum (AM), have yielded well over 1700 catalogued specimens, some of which are from the Australian EEZ and International Waters, and from depths ranging from 20 to 2340 m. This work provides the first comprehensive monographic account of the New Zealand Chirostyloidea, spanning nearly 150 years of collections (1874–2017).

Prior to this study, 38 species from two of the four families of the Chirostyloidea were known from the New Zealand region. The New Zealand chirostyloid fauna now covers three of the four families (except Kiwaidae) and comprises 86 species in eight genera: *Chirostylus* Ortmann, 1892, *Gastroptychus* Caullery, 1896, *Heteroptychus* Baba, 2018, *Uroptychodes* Baba, 2004, *Uroptychus* Henderson, 1888, *Eumunida* Smith, 1883, *Pseudomunida* Haig, 1979 and *Sternostylus* Baba, Ahyong & Schnabel, 2018. *Uroptychus nitidus* (A. Milne-Edwards, 1880) is herein designated type species for the genus. Twenty-six species are new to science and 23 represent new distribution records. All available material is examined and listed, all species are illustrated, and diagnoses and keys are provided. A wider phylogenetic study of the group is under way but preliminary results of DNA barcoding are used as a molecular taxonomy tool and discussed.

Chirostyloidea are typically associated with other macroinvertebrates, most commonly with large antipatharians or alcyonaceans and occasionally sponges, which are usually concentrated on marine habitats such as seamounts or deep-sea ridges. Some of their life history characteristics (abbreviated larval stages for three of the four families) and their evident resource-association have been linked to increased range restrictions and potentially higher rates of diversification than for galatheoids.

As expected, the New Zealand chirostyloid fauna shows a close biogeographic affinity with that of the tropical south-west Pacific and eastern Australia. A few species are widespread in the Indo-West Pacific and over 40% are currently considered endemic. Results of the present study demonstrate a considerably higher species richness than previously known for the New Zealand EEZ, more than doubling the known fauna of the region.

Many global regions remain entirely or partially unstudied, implying that a huge potential for species discovery remains. The New Zealand region is comparatively well-sampled, although some areas remain unstudied. It is suspected that only a small number of species might be added to the regional chirostyloid diversity in the future. Major work remains, however, with the inventory of outstanding Galatheoidea squat lobsters.

Non-technical summary

‘Squat lobster’ is the popular name for two distantly related groups of decapod crustaceans that have a similar body form, the Galatheoidea and Chirostyloidea. They are conspicuous elements of most marine environments, from shallow coastal waters to abyssal depths, in unusual habitats such as hot vents and cold seeps, and across most latitudes worldwide. Current global diversity stands at around 1300 species of galatheoids and around 345 chirostyloids. Over the last four decades, they have been the subject of considerable taxonomic and systematic study internationally, but the New Zealand squat lobster fauna has not been comprehensively examined.

New Zealand species of squat lobsters (Superfamily Chirostyloidea) are presented in this work, which considers and revises records spanning nearly 150 years of collections in the region (1874–2017). Prior to this study, 38 species from two of the four families of the Chirostyloidea were known from the New Zealand region. The New Zealand chirostyloid fauna now comprises 86 species in three families and eight genera, of which 26 species are new to science and 23 are new records. All available material is examined and listed, all species are illustrated, and diagnoses and keys are provided. A wider phylogenetic study of the group is under way but preliminary results of DNA barcoding are presented and discussed.

Collection records often point to a host association between the squat lobsters and other macroinvertebrates, most commonly large black corals or gorgonian octocorals, and occasionally sponges. These are usually concentrated on vulnerable marine habitats such as seamounts or deep-sea ridges. Additionally, three of the four families have a shorter larval development which has been suggested as the reason for the more limited regional distribution ranges.

As expected, the New Zealand chirostyloid fauna shows a close affinity with the tropical SW Pacific and eastern Australian species, with a limited number of widespread Indo-West Pacific species present, and over 40% are currently considered endemic. Results of the present study demonstrate a considerably higher species richness than previously known, more than doubling the known fauna of the region. Many global regions remain entirely or partially unstudied, implying that a huge potential for species discovery remains globally. The inventory of the New Zealand region is considered complete, with only a few potentially new chirostyloid squat lobsters to be recorded in the future. The inventory of the other superfamily, Galatheoidea, is still far from complete, however.

Keywords

Anomura, Chirostylidae, Eumunididae, Sternostylidae, *Chirostylus*, *Eumunida*, *Gastroptychus*, *Heteroptychus*, *Pseudomunida*, *Sternostylus*, *Uroptychodes*, *Uroptychus*, systematics, taxonomy, DNA barcoding, new species, seamounts, deep sea, associations, corals, Lord Howe Rise, Louisville Seamount Chain, Norfolk Basin, Norfolk Ridge, West Norfolk Ridge, Lord Howe Island, Lord Howe Rise, Challenger Plateau, Three Kings Ridge, Norfolk Basin, Macquarie Ridge, South Pacific, Wanganella Bank, New Zealand EEZ, Australian EEZ, International Waters

Introduction

Squat lobsters are small, flat, lobster-like crustaceans with long claws, differing from true lobsters in having only three pairs of walking legs and a short ‘tail’ or abdomen that folds under the body. They were once thought to belong to a single superfamily of the decapod infraorder Anomura (Baba *et al.* 2008), but phylogenetic studies clearly established that squat lobsters represent two divergent, distantly related clades within Anomura (e.g. Ahyong *et al.* 2009; Schnabel *et al.* 2011; Bracken-Grissom *et al.* 2013). Nevertheless, the squat lobsters are often treated together, as in the comprehensive book on the biology of squat lobsters (Poore *et al.* 2011), which combines information across both groups on a wide range of aspects, including taxonomy, ecology, physiology, and fisheries. The first group, Galatheoidea Samouelle, 1819, including porcelain crabs, is not included in this study. The Chirostyloidea Ortmann, 1892, mostly the deep-sea forms, is the focus here.

The chirostyloid squat lobsters are considerably less diverse than galatheoids, with 345 and 1256 accepted species names, respectively (WoRMS Editorial Board 2019). Macpherson & Schnabel (in Appeltans *et* *al*. 2012) proposed that between 80% and 60% of the diversity was still unknown for chirostyloids and galatheoids, respectively, and considering the ongoing rate of species discovery worldwide, these estimates appear reasonable. Since 2012, 159 species of Galatheoidea (including two new genera), and 129 species of Chirostyloidea (including two new genera and one new family) have been added to WoRMS; and the rate of discovery does not appear to be slowing down.

Many of these discoveries are based on material collected in better sampled areas within the southwestern Pacific. Previous collections include some of the 'Great Expeditions' of the 19th and the 20th centuries, including the H.M.S. *Challenger* expedition of 1873–1876, the British Antarctic *Terra Nova* expedition of 1910–1912, and the Danish *Galathea* expedition of 1950–1952. The French Tropical Deep-Sea Benthos (TDSB) programme (formerly MUSORSTOM, a collaboration between the Muséum nationale d'Histoire naturelle, Paris, and the Office de la Recherche Scientifique et Technique Outre-Mer) has now spent more than 40 years exploring the Indo-West Pacific region, with a focus on the tropical southwest Pacific around New Caledonia, Vanuatu, Fiji, Tonga, and French Polynesia. Richer de Forges *et al*. (2013) summarised the crustacean discoveries and research of this programme and the substantial discoveries that feature squat lobsters in abundance. The nearly 2.5-fold increase in known squat lobster diversity since the beginning of the programme is overwhelmingly attributable to the sustained efforts by Keiji Baba, Enrique Macpherson and Michèle de Saint Laurent, viz. Baba (1991a, 1991b, 2004), de Saint Laurent & Macpherson (1990a), de Saint Laurent & Poupin (1996), Macpherson (1993, 1994, 2004, 2006), and Macpherson & Baba (1993). Most recently, Baba (2018) described 106 new species of chirostylids from several French expeditions, with 100 new species in the genus *Uroptychus* Henderson, 1888 alone, and a further six species in the new genus *Heteroptychus* Baba, 2018. Baba's extensive examination of type material, the comprehensive key to the Indo-Pacific species, and detailed diagnoses for all species are invaluable for the accounts presented here.

Other work that laid the ground for the examination of the New Zealand squat lobster fauna are the accounts by Ahyong & Poore (2004) and Baba (1994, 2000) for the chirostyloids of Australia. The former includes five samples representing three species from the Lord Howe Rise, which, although part of the Australian EEZ, is geographically within the New Zealand area as defined below.

The New Zealand region is also well sampled considering its continental shelf as well as offshore plateaus, ridges, and rises, primarily due to extensive historical and ongoing fisheries research activities (Gordon *et al*. 2010). Recently, comprehensive New Zealand biodiversity survey programmes such as the Ocean Survey 2020, the 'Seamounts' or the 'Vulnerable Deep-sea Communities' programme, fisheries research and several international research voyages in the region, have added detailed collections in select habitats across the entire region and covering the entire bathymetric depth range.

To date, the taxonomy of the squat lobsters of New Zealand has received limited attention. The earliest accounts were provided by Henderson (1885, 1888) with the first three chirostyloid and three galatheoid species from samples made during the transit of H.M.S. *Challenger* through the region. Borradaile (1916) described two species of *Uroptychus* from the British Antarctic *Terra Nova* expedition on its way to the Ross Sea (1910–1912), Baba (1974) described four endemic New Zealand species, including two chirostylids, from the Chatham Rise, collected by the Japanese research vessel *Kaiyo Maru* in 1968. Gordon (1930) listed *Eumunida picta* Smith, 1883 from the Tasman Sea, now *Eumunida australis* de Saint Laurent & Macpherson, 1990a. More recently, Baba (2005) described two galatheoids from deep-sea samples from Milford Sound and the 'Kermadec Deep' (along the edge of the southern Kermadec Trench) taken by the Danish *Galathea* expedition (1950–1952). Schnabel & Bruce (2006) reviewed the known New Zealand species of *Munidopsis* Whiteaves, 1874 and described two new New Zealand species and Ahyong (2007) described the galatheoids collected by the 2003 NORFANZ expedition to the northern ridges of New Zealand, including 26 species, among them 12 new and one new genus. Schnabel (2009a) reviewed the New Zealand chirostylids, providing new New Zealand records for two species and describing six species of *Uroptychus* from off the Kermadec Islands. This formed part of a doctoral study that listed nearly 180 species of squat lobsters, including around 90 species each for galatheoids and chirostyloids (Schnabel 2009b). These accounts formed the basis for records provided by the New Zealand Inventory of Biodiversity (Webber *et al*. 2010) and the annotated checklist of New Zealand Decapoda (Yaldwyn & Webber 2011) as well as the distributional analysis of seamount and non-seamount squat lobsters of New Zealand (Rowden *et al*. 2010). Together with Ahyong *et al*. (2015) and Schnabel *et al*. (2017), who described the squat lobsters of the Macquarie Ridge and established two new species, 38 species of chirostyloids have so far been recorded from the New Zealand region. However, only about half of these have been documented in detail.

This work comprises the first comprehensive monographic account of the New Zealand Chirostyloidea, combining records spanning nearly 150 years of collections in the region (1874–2017), reviewing existing species, and naming new species. The chirostyloid fauna now comprises 86 species in three families and eight genera, of which 26 species are new to science and 23 species represent new records for the region. All available material in New Zealand natural history collections has been examined and relevant type specimens from international collections were re-examined. Keys, diagnoses, and full locality information are provided for all New Zealand species, and every species is illustrated. Where possible, live coloration is described and figured and information on the ecology and possible biological associations are provided.

Biology of Chirostyloidea

Less is known about the biology of chirostyloids than galatheoids, as showcased by the prevalence of galatheoid references in each of the book chapters on squat lobster biology (Poore *et al.* 2011). An updated summary of key characteristics of the current knowledge of natural history, ecology, and distribution of chirostyloids is provided here.

Larval development. Very few squat lobsters have been reared in the laboratory, but Van Dover & Williams (1991) showed that the egg size appears to be well-correlated with the development of the egg into either planktotrophic (plankton feeding) or lecithotrophic (yolk feeding) larva. Egg size is large (> 0.5 mm^3) for species of *Chirostylus* Ortmann, 1892, *Uroptychus* and *Kiwa* Macpherson, Jones & Segonzac, 2005 (and for galatheoid *Munidopsis*) and small (< 0.2 mm^3) for *Eumunida* Smith, 1883 (and most of the galatheoid species examined), and it was inferred that lecithotrophic larvae developed from large eggs and planktotrophic larvae developed from small eggs. While the cavity enclosed by the folded abdomen of species with small eggs can hold hundreds or even thousands of eggs, the clutch size is much smaller in chirostylids, with up to 20 eggs reported for a small species of *Uroptychus* (Baba *et al.* 2011). This is reflected in the material examined here, and the egg number and size are reported where available.

The morphology of zoeal larvae is known for nine chirostyloid species in five genera, the chirostylids *Chirostylus* (three species), *Gastroptychus* Caullery, 1896 (one species) and *Uroptychus* (three species), one kiwaid *Kiwa* and one eumunidid *Eumunida* (Baba *et al.* 2011, Thatje *et al.* 2015b). Some of the earliest descriptions of chirostyloid zoeae were provided for the New Zealand *Uroptychus tomentosus* Baba, 1974 and *Gastroptychus novaezelandiae* Baba, 1974 by Pike & Wear (1969). They indicated that the larvae hatch at an advanced developmental stage compared to galatheoid squat lobsters but unfortunately their descriptions lack much of the detail. More recently, the larvae of *Chirostylus stellaris* Osawa, 2007 and *Kiwa tyleri* Thatje, 2015a were shown as lecithotrophic with nonfunctional mouthparts, hatching at an advanced developmental stage with only one or two zoeal stages prior to development into the megalopa, the final larval stage (Fujita & Clark 2010; Thatje *et al.* 2015b). In contrast, all known galatheids and munidids (small eggs, planktotrophic larvae) have 4–6 zoeal stages preceding the final megalopa. The complete larval cycle of *Eumunida* is unknown, but the first zoea of two species have been illustrated (Guerao *et al.* 2006). They reported that the first zoea of *Eumunida* has fully functional appendages (and hence is not lecithotrophic) and does not hatch at an advanced developmental stage.

Feeding. Once squat lobsters settle into the benthos, they play an important role as recyclers of organic matter. They display variable and sometimes opportunistic feeding types including suspension feeding, deposit feeding, scavenging, predation, and occasional cannibalism, and in this process, contribute to local nutrient cycling (Lovrich & Thiel 2011). Very little is known, however, about the feeding of chirostyloids, primarily due to their deep-sea distribution and cryptic lifestyle associated with macroinvertebrates. Some notable exceptions are observations of the enigmatic 'yeti crab' *Kiwa*, the shallow-water *Chirostylus,* and the large deep-sea *Sternostylus* Baba, Ahyong & Schnabel, 2018 (previously *Gastroptychus*) (Thurber *et al.* 2011, Ogawa & Matsuzaki 1987, Le Guilloux *et al.* 2010, respectively).

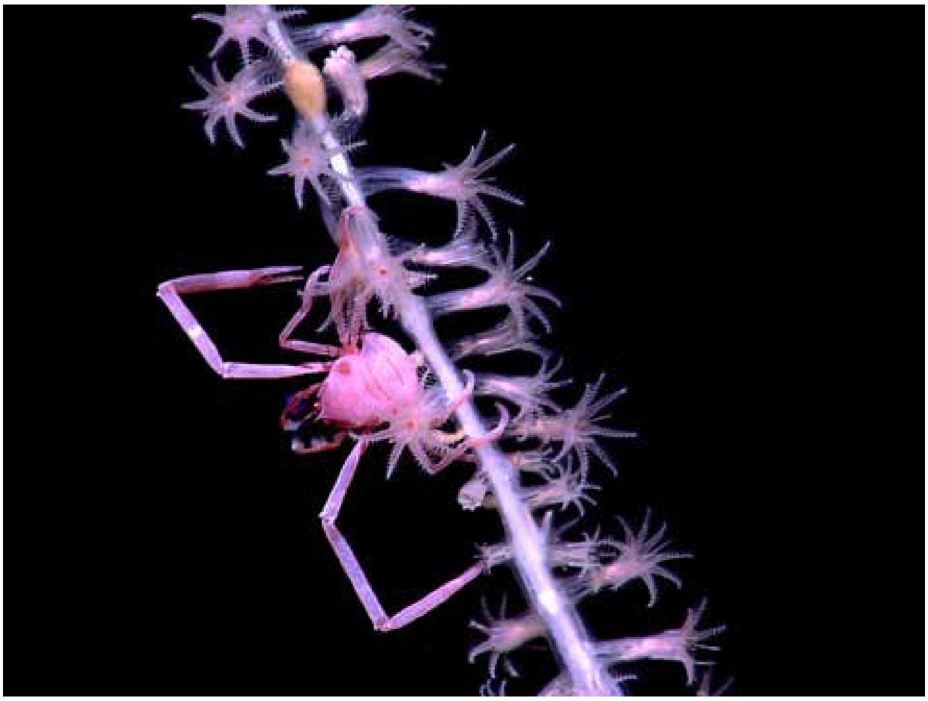
Species of the genus *Kiwa* occur exclusively in chemosynthetic habitats. *Kiwa puravida* Thurber, Jones & Schnabel, 2011 is the only species known from hydrocarbon seeps (off Costa Rica), while the other five occur at hydrothermal vents around the southern hemisphere, in sometimes staggering numbers (Roterman *et al.* 2018). All kiwaids possess bacteriophoran (plumose) setae, which harbour chemosynthetic bacteria (Thatje *et al.* 2015a). Stable isotope analysis showed that *K. puravida* relies nearly entirely on these epibiotic bacteria for food (Thurber *et al.* 2011), and it appears that all species actively farm these bacteria. This remarkable adaptation is shared with the vent munidopsid, *Shinkaia crosnieri* Baba & Williams, 1998, as reported by Tsuchida *et al.* (2011), and this clearly represents an enigmatic case of convergent evolution.

Specific feeding behavior has been reported for *Sternostylus formosus* (Filhol, 1884) in the North Atlantic by Le Guilloux *et al.* (2010), who conducted multiple deep-sea video-transects off Ireland. These large squat lobsters had a strong preference for the large black coral *Leiopathes* Haime, 1849 as a host, although they were also found on the gorgonian *Paramuricea* Kölliker, 1865 and another antipatharian of the genus *Bathypathes* Brook, 1889. The authors reported large numbers of individuals (up to nine) of all sizes sharing a single host coral without any apparent antagonistic behaviour, and they were seen repeatedly moving their chelae from the coral surfaces to their mouths and back while they collected prey or detritus in their maxillipeds, possibly indicating that they feed off the coral surfaces. Similarly, Hendrickx *et al.* (2014) provided *in situ* observations for *S. perarmatus* (Haig, 1968) in the Gulf of California on the large arborescent gorgonian *Callogorgia* Gray, 1858 and one or two large unidentified sponges, and they argued that the squat lobster was taking advantage of this passive filtering and feeding on the large particles of debris. In turn, it was also benefiting the coral in preventing it from being smothered. A similar feeding behaviour was observed for *Chirostylus dolichopus* Ortmann, 1892, a shallow-water chirostylid that was found on antipatharians, gorgonians, and, in one case, on a sponge, off Japan (Ogawa & Matsuzaki 1987). Species of both *Sternostylus* and *Chirostylus* have chelipeds that are densely covered with comb-like setae on the inner edges of the fixed finger and the dactylus (Ogawa & Matsuzaki 1987: fig. 4; Le Guilloux *et al*. 2010: fig. 4B). These are both used to brush fine food particles from the mucus layer of coral branches and for grooming and cleaning of the walking legs. Ogawa & Matsuzaki (1987) also reported that, after grooming, food debris is combed out of the cheliped by maxilliped 3, and that the gut was mainly filled with detritus and sand grains. This was supported by Le Guilloux *et al.* (2010), who found only homogenised detritus and a few minute pieces of crustacean exuvia in the gut of their specimens and concluded that *S. formosus* feeds on particulate organic matter and zooplankton trapped in mucus produced by the corals. The host coral is believed to provide multiple benefits, not only as a potential food source through the mucus, but also as protection from predation and most likely a vantage point for suspension feeding, although this has not been directly observed (Baeza 2011).

Many other chirostyloids are either known or assumed to be associated and to live in a presumed commensal relationship with macroinvertebrates, mostly cnidarians (Baeza 2011, Wicksten 2020). This is either directly observed *in situ* or inferred from morphological adaptations for clinging to a host. In many species, particularly of *Heteroptychus* and *Uroptychus*, the dactylus and the propodus of the walking legs are prehensile and can both be furnished with movable spines or expansions which aid clinging to branches of corals (Fig. 1). Often, species coloration appears to match that of putative hosts, e.g. *U. nitidus* (A. Milne-Edwards, 1880), reported by Pequegnat & Pequegnat (1970), *U. zezuensis* Kim, 1972 on a *Siphonogorgia* Kölliker, 1874 soft coral host (Baba *et al.* 2009) and the 'cryptic squat lobster' *U. joloensis* Van Dam, 1939 on a *Siphonogorgia* (Humann & DeLoach 2012). Unfortunately, live coloration remains unknown for many species. Within Eumunididae, *Eumunida picta* has been reported from deep-water corals *Primnoa resedaeformis* (Gunnerus, 1763) and *Lophelia pertusa* (Linnaeus, 1758) in the North West Atlantic and Gulf of Mexico (Buhl-Mortensen & Mortensen 2004; Kilgour & Shirley 2008). Most recently, Wicksten (2020) summarised *in situ* observations of chirostyloid squat lobsters and their hosts from ROV dives around the Central Pacific; all chirostyloids except for *Eumunida* spp. were observed on anthozoan hosts (*Eumunida* spp. were photographed on rocks, not coral), most species appeared to be host-specific (e.g. black corals, gold corals, or 'whip'-shaped forms), and nearly always only a single squat lobster inhabited a host colony (with the exception of *Sternostylus* species, where multiple specimens were seen on a single host).

Biogeography and distribution. Schnabel *et al.* (2011) presented a synoptic analysis of regional and bathymetric distributions of squat lobsters. Whereas Chirostyloidea are considered to be a primarily deep-water group, a comparison of depth ranges showed that the diversity peaked at, or just below, the continental shelf break (around 400 m) for both chirostyloids and galatheoids. Both groups contained shallow-water genera, namely *Chirostylus* and *Hapaloptyx* Stebbing, 1920 in the chirostyloids, and e.g. *Allogalathea* Baba, 1969, *Coralliogalathea* Baba & Javed, 1974 or *Sadayoshia* Baba, 1969 in the galatheoids. Overall, 31 of all the 42 squat lobster genera listed were entirely restricted to the upper 1000 m of the world's oceans. Exceptions were the monotypic eumunidid *Pseudomunida* Haig, 1979 (known from ~1000–1200 m), and the entire family Munidopsidae Ortmann, 1898, which includes the deepest known record for squat lobsters at 5491 m for *Munidopsis taiwanica* Osawa, Lin & Chan, 2008

Figure 1. An unidentified species of *Heteroptychus* on a branch of bamboo coral, Indonesia. Note the sub-prehensile walking legs adapted to grabbing the branches of the host. INDEX-SATAL Expedition 2010, "Site Landak", 1070–1340 m. Image courtesy of NOAA RV *Okeanos Explorer* Program.



from the Mariana Trench (Dong & Li 2018). The authors argued that munidopsid distribution patterns follow an evolutionary trajectory resulting in radiation into the deep-sea (and chemosynthetic) environment.

The deepest record for chirostyloids is 2750 m for *Uroptychus bicavus* Baba & de Saint Laurent 1992 from a hydrothermal vent site in the North Fiji Basin, one of only six records world-wide of Chirostyloidea from below 2000 m depth, of which two are from hydrothermal vents (Martin & Haney 2005). *Uroptychus bicavus* is the only chirostyloid recorded from > 2000 m in New Zealand here.

Schnabel *et al.* (2011) highlighted the Western Pacific as the hotspot of global diversity, with 82% of all known chirostyloidean species known at that time. This peak in diversity was much more pronounced than for Galatheoidea, which had only 66% of the world fauna in the western Pacific and a much higher species number in other oceans. However, these authors also pointed to the large portions on the global map that remained blank at the time, notably large parts of the southern Pacific and Atlantic Oceans.

Two major biogeographic provinces were identified in the western Pacific, the largest being a broad tropical western Pacific province that includes both the Indo-Australian Archipelago (IAA or 'coral triangle') and the tropical southwestern Pacific islands from New Caledonia to Tonga. A second southwestern Pacific (SWP) province combined the temperate southeastern Australian and New Zealand continental regions. This SWP province had a high level of endemicity (42% of 190 species of all squat lobsters), which Schnabel *et al.* (2011) identified as the only distinctly temperate assemblage worldwide. The biogeographic break between a northern tropical and southern temperate province is supported by the presence of the powerful flows of the East Australian Current and Tasman Front (Sokolov & Rintoul 2000), differences in water temperature, and particulate organic carbon (POC) fluxes to the seafloor (Watling *et al.* 2013).

Overall, Schnabel *et al.* (2011) found that squat lobsters in general, and chirostyloids in particular, had restricted ranges. Although a sampling effect cannot be excluded, chirostyloids were much more likely to be found in only one region. This is consistent with the hypothesis that chirostyloids, with an abbreviated larval development and by inference a shorter planktonic larval duration (PLD), have a more limited dispersal ability than most galatheoids and are less likely to maintain widespread panmictic populations (McClain & Mincks Hardy 2010; Meyer 2003). Limited dispersal potential of chirostyloids is also accentuated by specific habitat requirements and the discontinuous occurrences of their host corals and other anthozoans that usually occur along steep continental margins, undersea ridges, and seamounts (Rowden *et al.* 2010).

Rowden *et al.* (2010) examined squat lobster assemblages across seamount and surrounding non-seamount habitats of similar depths in the New Zealand region, and found chirostyloids to be more characteristic of seamount habitat and galatheoids more prominent in nearby non-seamount communities. This was linked primarily to host-associations of chirostyloids with typical seamount macroinvertebrates. The authors also upheld the 'island' effect *sensu* Richer de Forges *et al.* (2000), whereby benthic communities on seamounts and oceanic ridges were more likely to be more dissimilar to each other with distance than the more continuous non-seamount assemblages. However, this pattern did not appear to apply to all regions or habitats, and further studies remain to be done in this area.

Methods and materials

Sample collection. About 1720 specimens from over 710 sample lots were examined from the following collections: National Institute of Water and Atmospheric Research Invertebrate Collection, Wellington (NIWA); Museum of New Zealand Te Papa Tongarewa, Wellington (NMNZ); Auckland War Memorial Museum Tāmaki Paenga Hira, Auckland (AKM); Portobello Marine Biological Station, University of Otago, Dunedin (PMBS). Type and other reference material was examined by the author, or kindly examined by staff, at the respective institutions: the Natural History Museum, London (NHM); Muséum national d'Histoire naturelle, Paris (MNHN); National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM); Australian Museum, Sydney (AM); South Australian Museum (SAM), Adelaide; Bernice P. Bishop Museum, Honolulu, Hawai'i (BPBM); Zoological Museum, Natural History Museum of Denmark, Copenhagen (ZMUC).

Other than the historical collections (H.M.S. *Challenger*, *Terra Nova*, see above), samples were collected between 1956 and 2017 throughout the region, from depths between 20 and 2340 m (median of 465 m), typically using sleds, trawls, and dredges (unless otherwise indicated). The institutions that collected the specimens included NIWA (and its predecessor NZOI) through its various research programmes (e.g. Ocean Survey 20/20, Seamounts – their importance to fisheries and marine ecosystems, Vulnerable Deep-Sea Communities, *see* Acknowledgements) and fisheries research funded by the New Zealand Ministry for Primary Industries (MPI), the MPI Scientific Observer Programme (SOP), the Dominion Museum (now NMNZ), the New Zealand Department of Conservation, and New Zealand universities (Victoria University of Wellington, University of Otago, Dunedin).

A small number of specimens and images were collected by the original and new German research vessels, both named RV *Sonne*, in the New Zealand region (the joint German-New Zealand cruise SO135 in 1998, SO191–New Vents in 2007, and Project PoriBacNewZ of the Institute for Chemistry and Biology of the Marine Environment (ICBM), Carl von Ossietzky University of Oldenburg, on the new German RV *Sonne* (voyage SO254), using the GEOMAR Helmholtz Centre for Ocean Research Kiel ROV *KIEL 6000* (Schupp *et al.* 2017). Specimens collected by NIWA research vessels RV *Tangaroa* and RV *Kaharoa*, are cited as NIWA Stn TANXXXX/XX and NIWA Stn KAHXXXX/XX, respectively.

Area of study. The study area is defined as the New Zealand standard charting area covered by the Regional Bathymetry Chart of New Zealand (Charting Around New Zealand, CANZ 2008) and registered with the GEBCO Digital Atlas as sheet G.09. It covers latitudes 25°S–57°S and longitudes 157°E–167°W (Fig. 2) which includes the New Zealand 200 nautical mile Exclusive Economic Zone (EEZ), surrounding extra-territorial, or international waters, and portions of the Australian EEZ that surround Norfolk, Lord Howe, and Macquarie islands.

The New Zealand region encompasses a diverse range of underwater features: it rises from abyssal depth and, where the Pacific and Australian tectonic plates meet, includes an active continental margin with hydrocarbon seeps and hydrothermal vents. It includes an extended continental shelf with numerous plateaus and rises and four major ridge systems, one of Earth's deepest oceanic trenches, the Kermadec Trench, as well as troughs and canyons at various spatial scales. Scattered across these features and particularly dense along the continental margins and ridges are an estimated 800 seamounts (Batson 2003; Ramillien & Wright 2000; Wright *et al.* 2006).

The diverse bathymetry in conjunction with New Zealand's geographic location at the boundary between the Southern Ocean and the tropical southwest Pacific also creates a mosaic of hydrological and oceanographic conditions, including influences from major oceanic currents such as the Antarctic Circumpolar Current (ACC) in the south that is isolated from the Tropical Front in the north and a number of stable eddy systems (Chiswell *et al.* 2015) that influence local oceanic productivity and larval dispersal (e.g. Bradford 1982; Chiswell & Booth 1999, 2017). This environment poses many challenges for the investigation of marine biodiversity but provides an opportunity for examining factors influencing patterns of distribution (e.g. Rowden *et al.* 2010).

Sample examination and preparation. Specimens were primarily examined at NIWA, identified using available keys (e.g. Ahyong & Poore 2004; Baba 2005, 2018; de Saint Laurent & Poupin 1996) and recorded in a Microsoft Excel table (available from the author upon request) including all available location data from museums' station registers and published historical records. In May 2017, Keiji Baba (Kumamoto University, Japan) and Shane Ahyong (Australian Museum, Sydney) joined a one-week workshop at

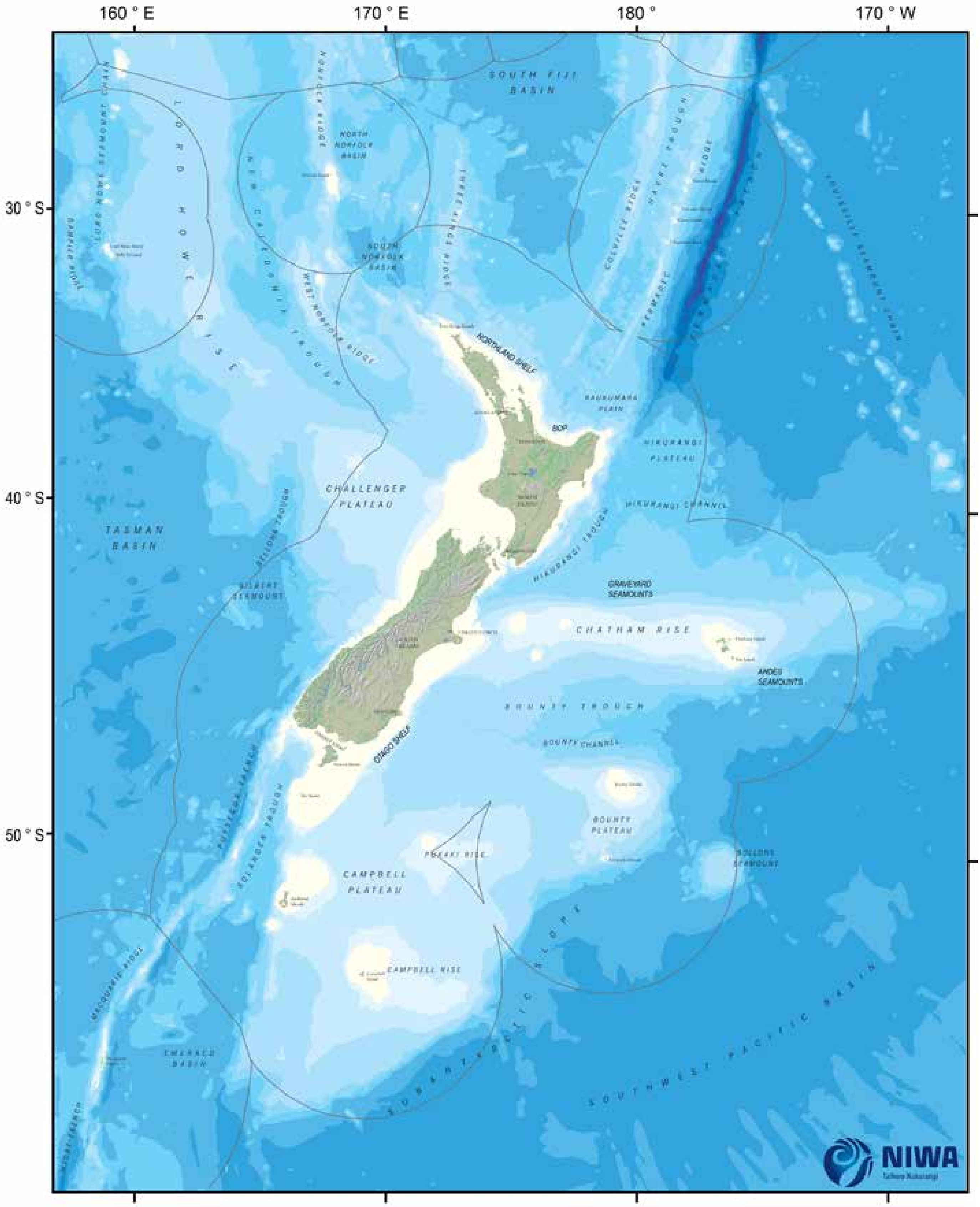


Figure 2. Major features of New Zealand's underwater landscape showing the New Zealand and neighbouring Exclusive Economic Zone boundaries. Bay of Plenty is abbreviated BOP. The New Zealand charting area follows CANZ (2008). Bathymetry after Smith & Sandwell (1997).

NIWA in Wellington to examine vouchers of most of the species presented. This provided an authoritative review of the taxonomic hypotheses proposed. Drawings were made using a WACOM Intuos3 and Intuos Pro Graphics Tablets and Adobe Illustrator CS6. Descriptions were prepared using DELTA - DEscriptive Language for TAxonomy Editor (Dallwitz 1980; Dallwitz *et al.* 1999). ESRI ArcMap version 10.4.1 was used to visualise spatial distributions and quality-check the data points. The bathymetric topography is based on the New Zealand region bathymetry data held at NIWA (Mitchell *et al.* 2016) (Mercator projection, horizontal datum WGS-1984).

Registration of type and general material. Primary and secondary type materials of new species, and additional material, are deposited in the NIWA Invertebrate Collection (NIC) at the National Institute of Water and Atmospheric Research (NIWA; formerly New Zealand Oceanographic Institute, NZOI), Greta Point, Wellington, using the prefix NIWA—; Museum of New Zealand Te Papa Tongarewa (formerly National Museum of New Zealand, NMNZ), using the prefix NMNZ CR.—; Auckland War Memorial Museum Tāmaki Paenga Hira (AKM), using the prefix AKM MA—; Australian Museum (AM), Sydney, using the prefix AM P.— and AM P—; Natural History Museum (NHM), London (formerly British Museum of Natural History) using the prefix NHMUK— (originally BMNH—); Zoological Laboratory of Kyushu University, Fukuoka, Japan, using the prefix ZLKU for registration numbers of Miyake collection now housed in the Kitakyushu Museum of Natural History and Human History, Kitakyushu, Japan.

Synonymies are provided for all species and based on the complete catalogue of the world squat lobsters (Baba *et al.* 2008) and the recent monograph on *Uroptychus* by Baba (2018).

This published work and the nomenclatural acts that it contains (i.e. creation of new species) have been registered in ZooBank (http://www.zoobank.org/), the official registry of Zoological Nomenclature. The ZooBank Life Science Identifier for this publication is urn:lsid:zoobank.org:pub:ADE41D41-1C35-4965-8D04-5C03C4E099A1. New scientific names are registered in Zoobank and the registration details are included as part of the descriptions under the subheading 'ZooBank registration'.

Morphological measurements. The general morphology of a chirostyloid squat lobster is given in Figs 3 and 4, exemplifying the major features referred to and terminology used in this work. Where several specimens were available for examination, comments on the allometric variation are provided and, in some cases, graphs show the relative variation of overall carapace and cheliped proportions with size and between males and females. Besides meristics, the spination varies allometrically with smaller specimens, often bearing fewer spines and small tubercles in places where larger adults have pronounced spines (Schnabel *et al.* 2017), and these are documented as appropriate.

The carapace length is used as a measure of size and is given as the total carapace length (cl), which includes the rostrum, unless stated otherwise. The postorbital carapace length (pcl) is measured from the posterior margin of the orbit to the posterior margin of the carapace. In both cases, the measurements are taken along the dorsal midline of the carapace and both are provided for all specimens where possible. The carapace width is measured at the greatest carapace width excluding spines.

Appendages are measured along the mid-length from the distal tip to the proximal end in a most extended position (see Fig. 3B). Some measurements taken for the thoracic sternite 4 are illustrated in Fig. 4C. All measurements are in millimetres (mm). Where more than one specimen could be included in the description, the measurements of the holotype are given in square brackets.

After the first citation of figures and tables relevant to the species under consideration, the figures will not be cited further within the description unless a particular feature is brought to the reader's attention, in which case the figure and letter will be cited in full.

Molecular taxonomy. To facilitate taxonomic identification, DNA barcoding (Hebert *et al.* 2003) was used where sufficiently fresh material was available. Tissue was extracted from muscle or branchial tissue of 113 specimens covering 58 putative species. Extraction using the DNeasy Blood & Tissue Kit (QIAGEN) followed the manufacturer's protocols. A partial sequence of the mitochondrial COI gene was amplified on an Applied Biosystems 2720 Thermal Cycler using the universal primer pair LCO1490/HCO2198 (Folmer *et al.* 1994) and a slightly modified primer pair (jgLCO1490/jgHCO2198, Geller *et al.* 2013). The polymerase chain reaction (PCR) protocol was as follows: the reactions were conducted in a total volume of 25 µL and processed with an initial denaturation step (95°C, 3 min), followed by 35 cycles of denaturation (95°C, 30 s), annealing (48°C, 30 s) and extension (72°C, 45 s), with a final extension of 5 min at 72°C. PCR products were assessed by agarose gel electrophoresis, cleaned using ExoSAP-IT reagent (USB, Cleveland, Ohio, USA) and commercially sequenced (Macrogen Inc., Seoul, Korea) using the same primers used for the PCR. Sequences were checked for potential contamination using the Basic Local Alignment Search Tool (BLAST) through GenBank. Sequences were checked, edited, and aligned using Geneious (v 10.1.2) (http://www.geneious.com, Kearse *et al.* 2012). The default Geneious Tree Builder function parameters were applied to assemble a Neighbor-Joining tree (Fig. 5) for branch length comparisons, using the Tamura-Nei Genetic Distance Model (Tamura & Nei 1993). The levels of sequence similarity are available in Supplementary Table – Pairwise genetic similarities, available upon request from the author, and available in the PDF of this memoir, available on https://niwa.co.nz/coasts-and-oceans/niwa-biodiversity-memoirs

Seafloor images of living squat lobsters. Most recent NIWA biodiversity voyages, and international voyages with ROV capability, provide seafloor images of living organisms and their habitat. NIWA's Deep Towed Imaging System (DTIS) provides increasingly detailed images for the accurate identification of organisms *in situ*; these images provide essential information for our understanding of the morphology and ecology of seafloor communities. Selected seafloor images of living squat lobsters, provided by NIWA, GEOMAR, and JAMSTEC are included as an addendum (Seafloor Images 1–16).

Terminology

The terminology used in the text generally follows Baba *et al.* (2011) and the key body parts and appendages are illustrated in Figs 3, 4.

abdomen – the posterior part of the body, articulating with the carapace, carried folded under the thorax in all squat lobsters, making at most the first four somites visible in dorsal view. It comprises six freely articulated somites and the telson. Each somite consists of a hardened dorsal tergite, a ventral sternite (characteristically uncalcified in the Chirostyloidea), and on each side a plate-like lateral epimeron (pleuron). The ornamentation and presence of transverse ridges, particularly on tergites 1 and 2 are variable and diagnostic. In Eumunididae, the anterolateral corner on either side of tergite 2 is strongly produced, which identifies this family. The abdominal somites 1–6 can carry paired appendages: those on somites 1–5 are called pleopods which are sexually dimorphic (see below); the last pair on somite 6 are called uropods. The telson and uropods form a tailfan (see under uropods below).

antenna – second cephalic appendage, placed posterolateral to the antennule, typically consisting of five articles (the peduncle) and a uniramous flagellum. The penultimate and ultimate articles are referred to as antennal articles 4 and 5, respectively. The antennal scale (or acicle) is variably developed and articulated with article 2, but only rarely is it entirely reduced (as in the genus *Chirostylus*) or fused to article 2 (in some species of *Heteroptychus* and *Uroptychus*).

antennule – first of the cephalic appendages, situated posterior to the eye, below the rostrum and between the antennae, consisting of three articles (the peduncle) and two multi-articulated flagella

bopyrid parasite – Bopyridae are a diverse family of endoparasitic isopods in which the adult females are highly modified parasites with a distorted, non-symmetrical body that are paired with a much smaller and less modified male (Boyko & Williams 2011). They occupy the branchial chamber of the host which, as a result, is often distinctly inflated.

branchial region of carapace – lateral carapace region posterior to the hepatic region, overlying the gills. Divided into anterior and posterior branchial region; the anterior branchial region is bordered by the anterior and posterior cervical grooves; the posterior branchial region lies posterior to where the posterior cervical groove intercepts the lateral margin.

carapace – shields the dorsal and lateral surfaces of the cephalothorax, anteriorly ending in a protruding rostrum. The carapace regions in most chirostyloids are not as well demarcated as in galatheoids but the same terminology is used for both (Baba *et al.* 2009, 2011). The dorsal surface is variously smooth, granulose or spinose and the placement and number of spines is typically diagnostic.

cardiac region of carapace – the central region of the carapace directly behind the cervical groove, indistinctly demarcated from the branchial and intestinal regions

cervical groove – distinct or indistinct depression across the transverse midline of the carapace. It separates the gastric region from the cardiac region. Towards the lateral carapace margins, it branches into anterior and posterior cervical groove which contain the anterior branchial region.

cheliped (pereopod 1) – see also pereopods. Pereopod 1 is chelate. The broad proximal part of the propodal cheliped is the palm, to which the grasping structures attach distally, composed of the dactylus (movable finger) and the pollex or fixed finger. The bearing surfaces of the movable and fixed fingers are the occlusal margins. The presence or absence of a patch of short, densely packed setae (setal pad), on the palm of some species of *Eumunida* is diagnostic. The dorsal view of the cheliped is as shown in Fig. 3B.

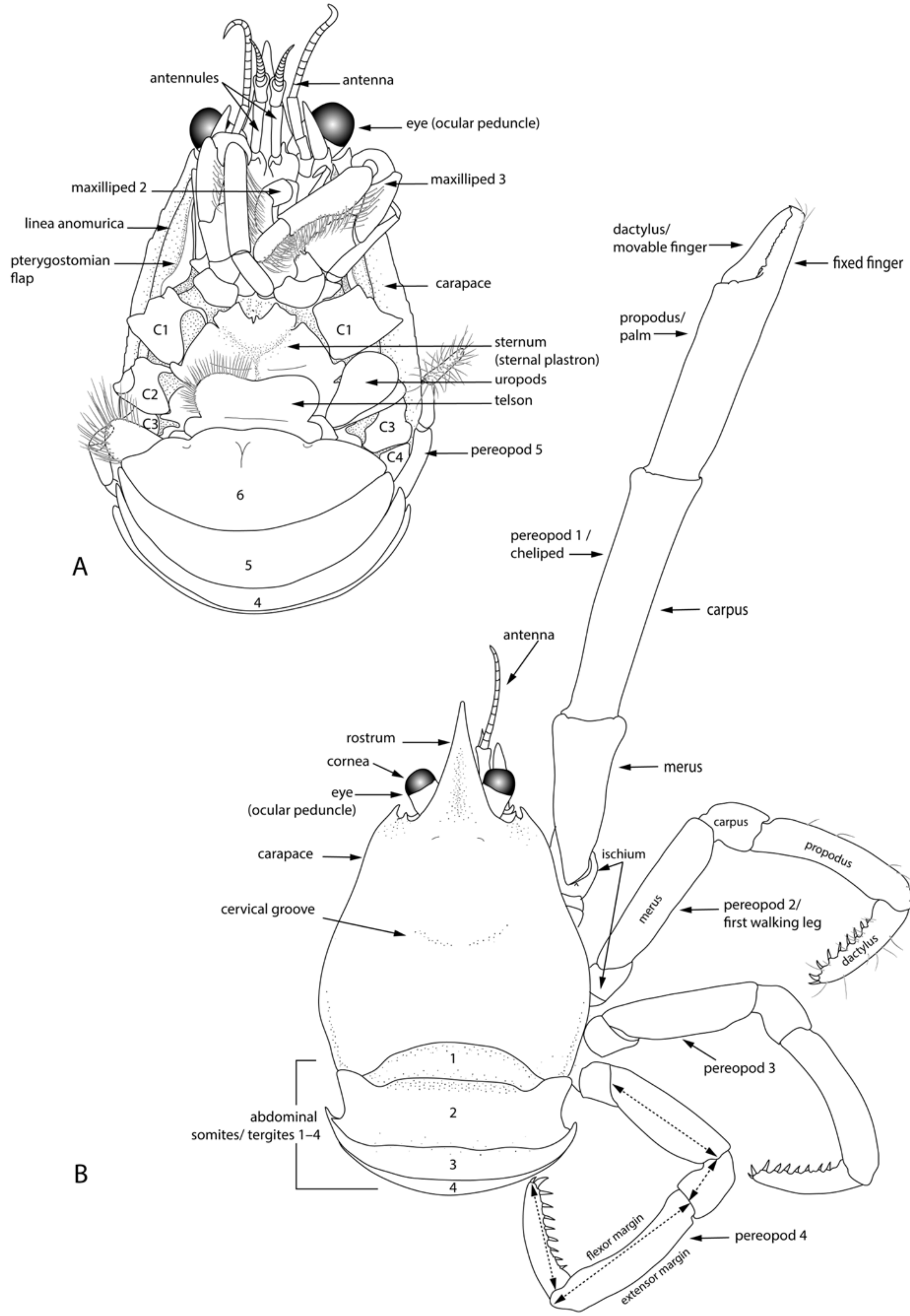


Figure 3. General morphology of a chirostyloid squat lobster, exemplified by *Uroptychus*: A. habitus, ventral; B. habitus and cheliped, dorsal view, walking legs (pereopods 2–4), lateral view. The abdominal somites are numbered 1–6 and coxal articles of the pereopods are labelled C1–C4.

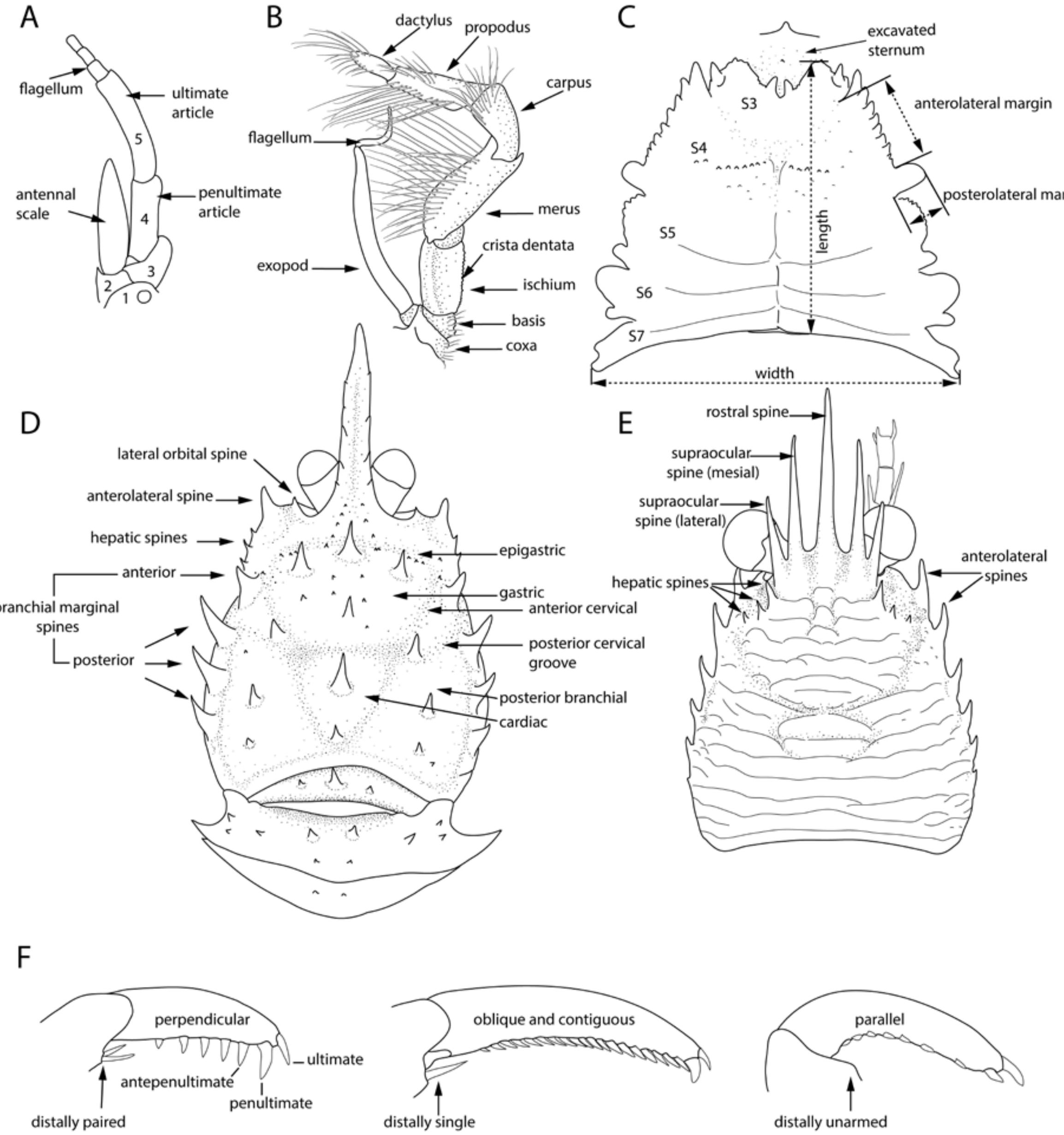


Figure 4. General morphology of a chirostyloid squat lobster, exemplified by *Uroptychus* (A–D) and *Eumunida* (E): A. antenna, articles 1–5 are numbered, ventral; B. Mxp3, ventral; C. excavated sternum and sternal plastron, sternites 3–7 are labelled S3–7; D. carapace regions and spines; E. terminology of carapace spines of *Eumunida*; F. schematic overview of the spination of the dactylus and distal propodus of walking legs.

cornea – cuticular covering of the ommatidia of the compound eye (see ocular peduncle), typically well-developed and often dilated

crista dentata – denticulate mesial ridge and ischium of the maxilliped 3, and which extends on to the basis

epigastric region of carapace – the central carapace region immediately posterior to the rostrum is often armed with spines. The epigastric region is laterally flanked by the hepatic region and followed by the mesogastric region.

excavated sternum – thoracic sternites 1, 2 and part of 3 are fused to form the excavated sternum, which is located between the bases of maxilliped 3 in Chirostylidae. It is clearly placed on a higher plane than the sternal plastron (see sternum) (or lower plane when the specimen is inverted) and creates a cavity into which the distal articles of maxilliped 3 can fold. In the Eumunididae, Kiwaidae and Sternostylidae, sternite 3 is confluent with sternites 1–2 and without a distinct step, and maxillipeds 3 are nearly adjacent and do not create a space over the excavated sternum that accommodates them to be folded into (Baba *et al.* (2018) for comparative illustrations). Whether the anterior margin of the excavated sternum is acute or rounded and has a distinct ridge or medial tubercle are considered diagnostic but remain to be fully examined for their utility in species discrimination in the future. These characters are relatively newly recognised and as such have not typically always been considered in taxonomic descriptions.

hepatic spines – carapace spines on the hepatic region, including dorsal and lateral spines. In Eumunididae, the row of spines placed behind the supraocular spines is called hepatic spines.

maxilliped 3 (Mxp3) – the most posterior appendage of the mouthparts. Whether the paired appendages are placed closely together or widely separated is diagnostic at a family-level; they are placed more or less adjacent in Eumunididae, Kiwaidae, and Sternostylidae and widely separated in Chirostylidae (Baba *et al.* 2018). The endopod (inner branch) of Mxp3 consists of five articles. The extent of the serration of the crista dentata can be diagnostic and is illustrated separately. The exopod (outer branch), an elongate two-articulate structure with a flagellum, is not taxonomically useful (see also mouthparts).

mouthparts – the mouthparts are composed of six pairs of appendages used for processing food and grooming. These are (from anterior to posterior) the mandible, maxillule, maxilla and maxillipeds 1, 2 and 3. The level of calcification and serration of the mandibular cutting edge are diagnostic at family-level (Schnabel & Ahyong 2010) but otherwise, only the Mxp3 is typically considered in morphological comparisons to date.

occlusal margins – the margins of the fixed (pollex) and movable (dactylus) finger of the cheliped (pereopod 1) that bear against each other, typically denticulate and can be gaping, often with proximal process in large males, and even in large females

ocular peduncle (eye) – the stalked compound eye, always movable in chirostyloids and well-developed in Chirostylidae, Eumunididae and Sternostylidae; in Kiwaidae, the eye is reduced to a small soft remnant. The proximal part is accommodated by a distinct orbit of the anterior carapace. The eye is a typical reflecting superposition eye (Baba *et al.* 2011) and a cornea is usually well-developed.

orbital spine – the lateral orbital angle is typically armed with a spine. The size and relative placement compared to the anterolateral spine can be diagnostic.

ovigerous (ov.) – egg-bearing

pereopods – pereopod 1 (P1, see under cheliped) is chelate, pereopods 2–4 (P2–4, see under walking legs) are walking or ambulatory legs and pereopod 5 is highly reduced and usually folded away; the latter is not used for locomotion and it is considered to be used for grooming, cleaning or possibly spermatophore transfer organs. All pereopods comprise (from base to tip) coxa, the basis, ischium, merus, carpus, propodus, and dactylus.

pleopods – paired abdominal appendages. Their morphology and function differ between sexes; in males, pleopods 1 and 2 (gonopods, abbreviated G1 and G2) are modified as copulatory or spermatophore transfer organs. The first male gonopod is absent in two chirostyloid families (Eumunididae, Kiwaidae) and present in Sternostylidae and Chirostylidae, and gonopod 2 is vestigial or absent in Eumunididae but otherwise present. In females, pleopod 1 is always absent and pleopod 2 is a simple uniramous appendage in Eumunididae, Kiwaidae and Sternostylidae, but absent in Chirostylidae. Pleopods 3–5 are rudimentary or absent. None of the pleopods are typically considered for morphological comparison.

pleuron – plate-like lateral extensions of the abdominal tergites

pterygostomian flap – lateral portion of the carapace covering the lateral side of the buccal cavity anteriorly and enclosing the branchial cavity posteriorly, and is demarcated by an uncalcified longitudinal suture, the linea anomurica

rhizocephalan parasite – barnacles of the Superorder Rhizocephala are well-known parasites of squat lobsters, although their life histories and specific host-parasite relationships remain relatively poorly known (Boyko & Williams 2011). The barnacle is a mesoparasite, partly embedded inside (the system of rootlets or 'interna') and outside the host (the 'externa'). They are divided into two orders, the Kentrogonida which typically form a single infection under the abdomen of the host, and the Akentrogonida, that can be colonial and produce hundreds of externae (on squat lobsters, these latter appear to mostly form on the pereopods and not under the abdomen).

rostrum – anterior projection of carapace, usually present in chirostyloids. It is highly variable in form and diagnostic at genus and species level. In *Chirostylus*, the rostrum is either absent or a minute spine. In *Pseudomunida* and *Eumunida*, the rostral spine is flanked by one or two lateral flanking spines (supraocular spines), respectively. In all other genera, the rostrum is narrowly or broadly triangular but of variable length and ornamentation. Baba (2018) introduced the ratio of the width of the rostrum to the posterior carapace width to distinguish a group of species with a wide rostrum (> 0.5) from that with a narrow rostrum (< 0.5). Here, the relative proportions of the rostral width at its base compared to the distance between the anterolateral spines is used as a reference point as this appeared less ambiguous.

setal pad – present in some species of *Eumunida*, see under cheliped (pereopod 1)

somite – a body segment or division of the body. The chirostyloid body plan, as in other squat lobsters, is composed of 19 somites (five cephalic, eight thoracic and six abdominal).

spine – the term 'spine' is usually used for a fixed projection of the integument (see Garm & Watling 2013) but the articulated 'robust setae' or 'spines' that furnish the flexor margins of the walking leg propodi and dactyli are typically referred to as spines in the squat lobster and other decapod literature (with a distinction being made between fixed or movable spines) and are used in the descriptions as such. Also, the range of less distinct ornamentation is being described with terms such as spinules, tubercles, and granules, which represents somewhat of a range from larger to smaller.

sternal plastron – see sternum

sternite/sternum – ventral plate of the thoracic or abdominal somite, between the bases of the appendages. The thoracic sternum or sternal plastron is formed by the fused thoracic sternites 3–7. In Chirostyloidea, thoracic sternite 8 is entirely unsclerotised, a shared character diagnosing the superfamily. The sternal plastron is nearly always calcified, except for the females in the genus *Heteroptychus* where the median parts of sternites 5–7 are unsclerotised. The length-width ratio of the sternal plastron and the shape of the lateral margins (e.g. widening posteriorly or subparallel) are important considerations. Also, the shape and spination of the anterior margin of the sternum (sternite 3) is diagnostic at genus and species level; and the margins and/or surfaces of sternites 4 and 5 are variable and can be used to differentiate species of the genus *Uroptychus*.

telson – last portion of the abdomen (not considered to be true somite, ventrally bearing anus) is folded beneath somite 6. In chirostyloids, the telson is transversely divided by a suture, which is diagnostic for the superfamily.

uropods – paired appendages of abdominal somite 6 that form a tailfan with the telson. They comprise a short peduncle to which attaches a broad, flattened endopod and exopod that are usually folded over each other. The tailfan is used for generating a rapid motion, and in the female to protect the eggs during incubation. They do not contain morphological characters that are used for comparison of taxa.

walking legs (P2–4) – see also pereopods. These appendages are structurally similar but can differ in size and spination and relative proportions of articles compared on one leg or between legs. In many chirostyloids, particularly of the genera *Heteroptychus* and *Uroptychus*, the dactylus and the propodus are prehensile, which has been interpreted as an adaptation to clinging onto coral branches. The relative size and the arrangement of the spines on the dactyli of all walking legs are important diagnostic characters that have often been ignored historically. Baba (2018) provided a useful guide to the terminology of the typical spination of P2–4 dactyli and his terminology is adopted here (Fig. 4F). Similarly, whether the distal spines on the P2–4 propodus are paired or single, the relative distance of the spines from the juncture with the dactyli, and whether a row of spines along the flexor margin forms a zigzag pattern or not are diagnostic for some species or groups of species.

Abbreviations

AIMS	Australian Institute of Marine Science, Townsville, Australia
AKM	Auckland War Memorial Museum Tāmaki Paenga Hira, Auckland, New Zealand
AM	Australian Museum, Sydney, Australia
BPBM	Bernice P. Bishop Museum, Honolulu, Hawai'i
cl	carapace length (including rostrum)
COI	Mitochondrial cytochrome *c* oxidase I gene
CSIRO	Commonwealth Scientific and Industrial Research Organisation, Canberra, Australia
DNA	Deoxyribonucleic acid
DTIS	NIWA's Deep-Towed Imaging System
EEZ	Exclusive Economic Zone
GB	National Center for Biotechnology Information (NCBI) GenBank
GEBCO	General Bathymetric Chart of the Oceans
GEOMAR	Research Centre for Marine Geosciences, Helmholtz Centre for Ocean Research Kiel, Germany
ICBM	Institute for Chemistry and Biology of the Marine Environment, Carl von Ossietzky University of Oldenburg, Germany

JAMSTEC	Japan Agency for Marine-Earth Science and Technology, Yokosuka, Kanagawa Prefecture, Japan
MNHN	Muséum National d'Histoire Naturelle, Paris, France
MPI	New Zealand Ministry for Primary Industries, formerly Ministry of Fisheries
Mxp	maxilliped
MZS	Museé Zoologique, Strasbourg, France
NHM	Natural History Museum, London, United Kingdom
NIRVANA	Nascent Inter-ridge Volcanism And Neotectonic Activity, *Tangaroa* voyage TAN1213
NIWA	National Institute of Water and Atmospheric Research, Wellington
NMNZ	Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand
NMV	Museums Victoria, Melbourne, Australia
NOAA	National Oceanic and Atmospheric Administration, U.S. Department of Commerce
NORFANZ	Joint New Zealand and Australia Norfolk Ridge–Lord Howe Rise Biodiversity Voyage in 2003, *Tangaroa* voyage TAN0308
NZOI	New Zealand Oceanographic Institute (now NIWA), Wellington, New Zealand
ov.	ovigerous
P1	pereopod 1 (cheliped)
P2–4	pereopods 2–4 (first to third walking legs)
pcl	postorbital carapace length (rostrum not included)
PMBS	Portobello Marine Biological Station, University of Otago, Dunedin, New Zealand
SAM	South Australian Museum, Adelaide, Australia
SOP	Scientific Observer Programme, MPI, New Zealand
TMAG	Tasmanian Museum and Art Gallery, Hobart, Australia
USNM	National Museum of Natural History, Smithsonian Institution, Washington DC, USA
VUW	Victoria University of Wellington
VUZ	Victoria University of Wellington Zoology Department, Wellington, New Zealand
ZLKU	Zoological Laboratory of Kyushu University, Fukuoka, Japan
ZMUC	Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark
ZSIC	Zoological Survey of India, Calcutta, India

Acknowledgements

Specimens were provided from several collections and thanks are due to the staff for their diligent assistance; foremost, this is the team at the NIWA Invertebrate Collection in Wellington, Sadie Mills, Diana Macpherson, Caroline Chin and Dean Stotter. Rick Webber at NMNZ, Severine Hannam at AKM and Anna Wood at PMBS provided the other specimens from within New Zealand. Access to specimens from international institutions were kindly provided by Régis Cleva (MNHN), Stephen Keable (AM), Rachael King (SAM), Martha Nizinski and Rafael Lemaître (USNM), Miranda Lowe (NHMUK), Jørgen Olesen (ZMUC) and Jo Taylor and Gary Poore (NMV). Live specimen photographs were mostly taken by Rob Stewart, Chazz Marriott, and Owen Anderson of NIWA, and Karen Gowlett-Holmes (CSIRO). Unpublished DNA sequence data was generously provided by Nikolaos Andreakis (AIMS) and Laure Corbari (MNHN). Shane Ahyong (AM) permitted the use of an unpublished figure of *Uroptychus alcocki* (Fig. 29) and *Eumunida australis* (Fig. 203) and provided fresh tissue from an Australian reference specimen for *Uroptychus flindersi*. Also, thanks for identifications of the associated corals go to Dennis Opresko (USNM), Candace Untiedt (University of Tasmania), and Rob Stewart (NIWA).

Many thanks to Michelle Kelly (NIWA) for her support of this project over the years, and many other NIWA colleagues who provided a wealth of information (Di Tracey, Arne Pallentin, Judy Sutherland, Ashley Rowden, and Malcolm Clark). Thanks to Blayne Herr of TCMedia for the design of the Memoir and compilation of the seafloor images of living squat lobsters, Geoff Gregory, Word Therapy, for his work in layout and design, and Julia Wilson-Davey (Te Papa Tongarewa) for providing registration numbers. Kia ora to Lee Rauhina-August, Pou Ārahi - Māori Development Leader at NIWA (Taranaki Nui Tonu), for advice on the use of the Māori language. In particular, I thank Shane Ahyong (AM), Keiji Baba (Kumamoto University, Japan) and Gary Poore (NMV) for samples, data, advice, critical comments on the manuscript draft, and their collegiality.

Specimens were collected by the following research projects: the 2003 NORFANZ voyage TAN0308 – a survey of the northern Tasman Sea sponsored by the

National Oceans Office, CSIRO Marine Research, Australia, New Zealand Ministry of Fisheries and NIWA, New Zealand, project ZBD2002-16. Many voyages were conducted as part of the project 'Seamounts: their importance for fisheries and marine ecosystems' (NIWA programme funded by the New Zealand Foundation for Science Research and Technology (FRST) contracts, with complementary funding from the New Zealand Ministry of Fisheries, C01X0224). These were e.g. voyages KAH9907, KAH0204, TAN0104, TAN0205, TAN0307, TAN0413, TAN0604, TAN0905 but also included the interdisciplinary voyages: TAN0616 – RENEWZ I / NEW ZEEPS, the first component of the project Exploration of Chemosynthetic Habitats of the New Zealand Region, funded by NOAA Ocean Exploration and NIWA, with co-funding from Woods Hole Oceanographic Institution, Scripps Oceanographic Institution, and the University of Hawai'i, and the TAN0803 – 'MacRidge 2' Macquarie Ridge voyage, an interdisciplinary New Zealand-Australian voyage which also contributed to CSIRO's Division of Marine and Atmospheric Research project "Biodiversity Voyages of Discovery" funded by the CSIRO Wealth from Oceans Flagship and the 'Seamounts' project. Subsequently, the project expanded to 'Impact of resource use on vulnerable deep-sea communities' (CO1X0906), funded by FRST (voyage TAN1206). This project contributed staff time and materials to a number of NIWA biodiversity or collaborative voyages such as: TAN1007 – Kermadec Arc Minerals (KARMA) voyage (Contract CO1X0808), funded by the Ministry of Business, Innovation & Employment (MBIE), in collaboration with Auckland University, GNS Science (New Zealand), and Woods Hole Oceanographic Institute (USA); TAN1104 – Ocean Survey 20/20 Mapping the Mineral Resources of the Kermadec Arc Project, funded by Land Information New Zealand (LINZ), GNS Science, and NIWA; TAN1116 – Food-web dynamics of New Zealand marine ecosystems project supported by the New Zealand government under "Coasts & Oceans" core funding from MBIE; TAN1213 – Nascent Inter- Ridge Volcanic And Neotectonic Activity (NIRVANA) voyage, funded by MPI, in collaboration with Auckland University, GNS Science, and the University of New Hampshire (USA), and additional MBIE funding; TAN1612 "Biodiversity of the Kermadec Islands and offshore waters of the Kermadec Ridge – a coastal, marine mammal and deep-sea survey", funded by the Marine Funding Advisory Research Group, NIWA (project COBR1705), Ministry for the Environment, Te Papa Tongarewa, Auckland War Memorial Museum and The Pew Charitable Trust.

Samples from five voyages were part of the Ocean Survey 20/20 project by the New Zealand government: TAN0705 and TAN0707 Ocean Survey 20/20 Chatham/Challenger Biodiversity and Seabed Habitat Project, jointly funded by the New Zealand Ministry of Fisheries, LINZ, NIWA, and New Zealand Department of Conservation; TAN0906 – Ocean Survey 20/20 Bay of Islands Coastal Biodiversity, Sediment and Seabed Habitat Project, funded and owned by LINZ; TAN1108 – Biogenic Habitats on the Continental Shelf project, funded by New Zealand MPI (Fisheries) (Biogenic Habitats: ZBD200801), New Zealand Foundation for Research, Science and Technology (CCM: CO1X0907), NIWA Capability Fund (CF111358) and Oceans Survey 20/20 R/V *Tangaroa* days funded by LINZ; TAN1312 – Oceans Survey 20/20 Reinga Basin voyage, funded by LINZ and NZP&M (New Zealand Petroleum & Minerals).

Finally, several specimens were provided by the German research vessel, RV *Sonne*: Voyage SO191 (2007) – New Vents programme conducted by the Leibniz-Institut für Meereswissenschaften (IFM-GEOMAR) at the Universität Kiel and partners; Voyage SO254 (2017) – Project PoriBacNewZ of the Institute for Chemistry and Biology of the Marine Environment (ICBM), Carl von Ossietzky University of Oldenburg, on RV *Sonne*, using the GEOMAR Helmholtz Centre for Ocean Research Kiel ROV *KIEL 6000* with participation and funding from GEOMAR, DSMZ, LMU, NIOZ, NIWA, and ETH-Zurich. NIWA voyage participation was funded through MBIE SSIF Enhancing Collections project.

Several specimens were collected as bycatch during NIWA research fisheries trawl surveys (e.g. KAH0806, KAH0905, KAH1205, KAH1308) and by observers on New Zealand fishing vessels under the Scientific Observer Programme (SOP), funded by MPI (stations beginning with TRIPXXXX).

Financial support was provided by NIWA under Coasts and Oceans Research Programme 2 Marine Biological Resources: Discovery and definition of the marine biota of New Zealand (2009/2010 to 2019/2020 SCIs).

Close-up image of *Gastroptychus novaezelandiae* collected north of Gisborne at a depth of 536 m by the GEOMAR ROV *KIEL 6000* onboard RV *Sonne* (ICBM expedition SO254, NIWA 127128).

TAXONOMY & SYSTEMATICS

Checklist of species from the New Zealand region

Species that have been previously documented from the New Zealand region, based on formally examined and accessioned specimens, are listed with a superscript[1]. Species with a superscript[2] are listed in either Schnabel (2009b), Webber *et al.* (2010) or Yaldwyn & Webber (2011) yet were never formally identified and listed with accession numbers. Species lacking a superscript are considered new records for the region.

Phylum ARTHROPODA von Siebold, 1848
Class MALACOSTRACA Latreille, 1802
Order DECAPODA Latreille, 1802
Infraorder ANOMURA MacLeay, 1838
Superfamily CHIROSTYLOIDEA Ortmann, 1892
Family CHIROSTYLIDAE Ortmann, 1892
Genus ***Chirostylus*** Ortmann, 1892
Chirostylus novaecaledoniae Baba, 1991[2]
Chirostylus cf. *dolichopus* Ortmann, 1892
Genus ***Gastroptychus*** Caullery, 1896
Gastroptychus novaezelandiae Baba, 1974[1]
Genus ***Heteroptychus*** Baba, 2018
Heteroptychus claudeae Baba, 2018[1]
Heteroptychus colini Baba, 2018[1]
Genus ***Uroptychodes*** Baba, 2004
Uroptychodes epigaster Baba, 2004[2]
Uroptychodes spinimarginatus (Henderson, 1885)[1]
Genus ***Uroptychus*** Henderson, 1888
Uroptychus ahyongi **sp. nov.**
Uroptychus alcocki Ahyong & Poore, 2004[1]
Uroptychus annae Baba, 2018
Uroptychus anomalus **sp. nov.**
Uroptychus aotearoa **sp. nov.**
Uroptychus australis (Henderson, 1885)[1]
Uroptychus baeomma Baba, 2018
Uroptychus bathamae **sp. nov.**
Uroptychus belli **sp. nov.**
Uroptychus belos Ahyong & Poore, 2004[1]
Uroptychus bicavus Baba & de Saint Laurent, 1992[2]
Uroptychus bispinatus Baba, 1988
Uroptychus brevisquamatus Baba, 1988
Uroptychus cardus Ahyong & Poore, 2004[2]
Uroptychus chathami **sp. nov.**
Uroptychus cylindropus Baba, 2018
Uroptychus defayeae Baba, 2018
Uroptychus depressus Baba, 2018
Uroptychus disangulatus Baba, 2018
Uroptychus duplex Baba, 2018
Uroptychus empheres Ahyong & Poore, 2004[2]
Uroptychus enriquei Baba, 2018
Uroptychus havre **sp. nov.**
Uroptychus helenae **sp. nov.**
Uroptychus ihu **sp. nov.**
Uroptychus inaequalis Baba, 2018[2]
Uroptychus inermis Baba, 2018
Uroptychus kaitara Schnabel, 2009[1]
Uroptychus koningen **sp. nov.**
Uroptychus laperousazi Ahyong & Poore, 2004[2]
Uroptychus leptus **sp. nov.**[2]

Genus ***Uroptychus*** Henderson, 1888 (*continued*)

Uroptychus litosus Ahyong & Poore, 2004
Uroptychus longior Baba, 2005
Uroptychus longvae Ahyong & Poore, 2004[2]
Uroptychus macquariae Schnabel, Burghardt & Ahyong, 2017[1]
Uroptychus maori Borradaile, 1916[1]
Uroptychus megistos Baba, 2018[2]
Uroptychus multispinosus Ahyong & Poore, 2004[2]
Uroptychus nieli **sp. nov.**[2]
Uroptychus nigricapillis Alcock, 1901
Uroptychus nirvana **sp. nov.**
Uroptychus novaezealandiae Borradaile, 1916[1]
Uroptychus numerosus Baba, 2018
Uroptychus paku Schnabel, 2009[1]
Uroptychus palmaris Baba, 2018
Uroptychus pars **sp. nov.**
Uroptychus plumella Baba, 2018
Uroptychus politus (Henderson, 1885)[1]
Uroptychus proberti **sp. nov.**
Uroptychus raymondi Baba, 2000[2]
Uroptychus remotispinatus Baba & Tirmizi, 1979
Uroptychus ritchie **sp. nov.**
Uroptychus rungapapa **sp. nov.**
Uroptychus rutua Schnabel, 2009[1]
Uroptychus sadie **sp. nov.**
Uroptychus spinirostris (Ahyong & Poore, 2004)[2]
Uroptychus spinosior Baba, 2018
Uroptychus taniwha **sp. nov.**
Uroptychus taranaki **sp. nov.**
Uroptychus taranui **sp. nov.**
Uroptychus taratara **sp. nov.**
Uroptychus tasmani **sp. nov.**
Uroptychus terminalis Baba, 2018[2]
Uroptychus thermalis Baba & de Saint Laurent, 1992[2]
Uroptychus toka Schnabel, 2009[1]
Uroptychus torrancei **sp. nov.**
Uroptychus tomentosus Baba, 1974[1]
Uroptychus tracey Ahyong, Schnabel & Baba, 2015[1]
Uroptychus vulcanus Baba, 2018
Uroptychus webberi Schnabel, 2009[1]
Uroptychus yaldwyni Schnabel, 2009[1]
Uroptychus yokoyai Ahyong & Poore, 2004[1]

Family EUMUNIDIDAE A. Milne-Edwards & Bouvier, 1900
Genus ***Eumunida*** Smith, 1883

E. australis de Saint Laurent & Macpherson, 1990a[1]
E. spinosa Macpherson, 2006
E. sternomaculata de Saint Laurent & Macpherson, 1990a
Eumunida sp.

Genus ***Pseudomunida*** Haig, 1979

P. fragilis Haig, 1979

Family STERNOSTYLIDAE Baba, Ahyong & Schnabel, 2018
Genus ***Sternostylus*** Baba, Ahyong & Schnabel, 2018

S. niwa **sp. nov.**
S. rogeri (Baba, 2000)[2]

Molecular taxonomy

A total of 113 specimens were successfully sequenced for the partial COI gene. In addition to 22 sequences downloaded from the NCBI GenBank database (provided by Poore & Andreakis 2011; Puillandre *et al.* 2011; Roterman *et al.* 2013; 2018), this covers 75 putative species in all four currently recognised families and nine genera. The sequence alignment consisted of 659 basepairs and pairwise sequence similarity ranged from 100% to 71.4% with a clear 'barcoding gap' apparent between intraspecific divergences (≤ 2%) and interspecific divergences (≥ 5%) for most species (*but see comments below*). The information was primarily used for morphospecies identification (DNA barcoding) (*sensu* Costa *et al.* 2007) using measures of genetic similarity and branch lengths indicated on a Neighbor-Joining tree (Fig. 5). Where available, comments are provided in a "DNA sequence analysis," section that follows the "Remarks" section in the description of each relevant species. A wider phylogenetic study of these squat lobsters is currently ongoing, and the sequences are not yet formally deposited online but are available on request.

DNA sequence data has proven an invaluable tool in aiding species identifications, particularly in difficult taxa that offer limited diagnostic characters, such as the genera *Heteroptychus*, *Eumunida* and the 'smooth' members of the genus *Uroptychus*. In particular, the available reference sequences of type specimens of the genus *Eumunida* (Puillandre *et al.* 2011) allowed for a high level of confidence of identification. The number of species currently represented in online databases such as GenBank, however, remains relatively small. Unpublished sequences allowed for pairwise similarity comparison confirming some identifications (e.g. *U. raymondi* Baba, 2000 and *U. enriquei* Baba, 2018) (N. Nikolaos, L. Corbari, unpubl.). In some cases, divergences clearly exceeded typical intraspecific levels, which supported the description of new New Zealand species (e.g. *U. aotearoa* **sp. nov.** was originally identified as *U. bardi* McCallum & Poore, 2013 and *U. nieli* **sp. nov.** as *U. flindersi* Ahyong & Poore, 2004). Some specimens showed interspecific levels of genetic distances highlighting the potential presence of distinct species, but in most cases, insufficient material and/or morphological characters were available to formally describe them (e.g. *Heteroptychus claudeae* Baba, 2018, *Uroptychus spinirostris* (Ahyong & Poore, 2004), *U. thermalis* Baba & de Saint Laurent, 1992 or *Eumunida* sp.). These specimens were considered in the morphological examinations and comments are provided where they might differ from the remaining material, but in all cases, they are presented under the species to which they are most similar.

Several wider systematic questions remain within the Chirostyloidea. Recent establishment of the three families Kiwaidae, Eumunididae and Sternostylidae is supported by morphological and molecular evidence in all cases, and these clades are apparent in the CO1 data presented here (Fig. 5). However, considerable uncertainty remains in the phylogenetic relationships of taxa within Chirostylidae. Specifically, the genus *Gastroptychus* comprises two distinct groups of species, one group with an extremely short P2–4 carpus, which includes the New Zealand species *G. novaezelandiae*, and a group with a long carpus (represented by *Gastroptychus* sp. 3804 placed remotely to *G. novaezelandiae* in Fig. 5). Baba *et al.* (2018) suggested that these might represent two genera, and preliminary indications here are that the genus *Gastroptychus* as currently defined may not be monophyletic.

Secondly, the genus *Heteroptychus* Baba, 2018 is most likely monophyletic and it is placed basally to most of the remaining chirostylids (which differs slightly from phylogenetic analyses by both Schnabel *et al.* (2011) and Bracken-Grissom *et al.* (2013), and these deeper relationships will need to be addressed in the future). Arguably more challenging is the apparent lack of morphological characters to distinguish between the species of this recently established complex (Baba 2018). This is not unlike other squat lobsters which have shown significant levels of genetic divergences coupled with limited morphological variation. Poore & Andreakis (2011) established two additional species in the '*Uroptychus naso*' group following DNA analysis. Cabezas *et al.* (2011), Poore & Andreakis (2011, 2014), Macpherson & Robainas-Barcia (2013, 2015) and Rodríguez Flores *et al.* (2019) have investigated cryptic species of the galatheoids *Allogalathea*, *Agononida*, *Lauriea*, *Galathea* and *Coralliogalathea*, respectively, and recognised new species in all cases. The same may be required for the genus *Pseudomunida*, which is so far monotypic with a wide central and western Pacific distribution. CO1 sequence data for specimens from the southwestern Pacific and French Polynesia indicate interspecific levels of divergence, and this genus requires a comprehensive re-examination (Macpherson & Schnabel, unpubl.).

Thirdly, the species of *Uroptychodes* are united in a single clade but are also placed within *Uroptychus* in the gene tree, a pattern also found by Schnabel *et al.* (2011) and Roterman *et al.* (2018). The genus *Uroptychus* contains nearly 260 species and, as mentioned above, efforts are under way to determine the phylogenetic structure within the genus and in relation to other chirostylids (see Baba (2018) for a comprehensive list of species that need consideration). For the New Zealand

Figure 5. Neighbor-Joining phylogram based on the Tamura-Nei distance model, showing patterns of CO1 sequence divergence for 134 species in four families of Chirostyloidea. *Uroptychus* is abbreviated to *U.* and all other genera are presented in bold font. Sequences annotated with 'GB' are derived from NCBI Genbank. The scale bar indicates a p-distance of 0.04 or 4 % sequence divergence.

fauna, this includes the 'spiny' species *U. spinirostris*, *U. numerosus,* and now *U. sadie* **sp. nov.** and a species that entirely lacks spines along the flexor margin of the P2–4 walking leg dactyli, *U. inaequalis*.

Expanding the existing molecular dataset will help identify clades within *Uroptychus* and shared morphological characters that will help taxonomic refinement. This will also provide an opportunity to examine whether current characters that are important for species diagnostics such as the morphology of the P2–4 dactylar and propodal spines are phylogenetically informative.

Systematics

Phylum **Arthropoda** von Siebold, 1848
Subphylum **Crustacea** Brünnich, 1771
Class **Malacostraca** Latreille, 1802
Order **Decapoda** Latreille, 1802
Infraorder **Anomura** MacLeay, 1838
Superfamily **Chirostyloidea** Ortmann, 1892

Chirostylidae Ortmann, 1892: 244.
Chirostyloidea Schnabel & Ahyong 2010: 57; Schnabel, Ahyong & Maas 2011: 10; Macpherson & Baba 2011: 42.

Diagnosis. Body symmetrical, carapace with or without transverse striae; rostrum variously developed, usually prominent; supraocular spines present or absent. Sternal plastron consisting of sternites 3–7. Thoracic somite 8 without sternal plate. Abdomen well-developed, all somites sclerotised, articulating. Tailfan well-developed, folded beneath preceding somite; telson and uropods laminar. Telson transversely divided by suture. Antennal peduncle consisting of five articles; scale present or absent. Mandible with toothed cutting edge. Maxilliped 1 with or without epipod. Cheliped always chelate. Pereopod 2–4 as walking legs. Maxilliped 3 and pereopods without epipods. Gills phyllobranchiate (Schnabel & Ahyong 2010).

Remarks. Chirostyloidea was established by Schnabel *et al.* (2011) based on a combined analysis of morphological (including adult, sperm, and larval) and molecular characters across all major anomuran groups. Characteristic chirostyloid synapomorphies are a transverse suture that divides the telson, the absence of the eighth thoracic sternite, and a toothed mandibular cutting edge. Previously, chirostyloids had been united in the Galatheoidea, but most of the putative shared characters were resolved as plesiomorphic. With the chirostyloids removed, the Galatheoidea (containing four families, including the Porcellanidae or porcelain crabs) form a unified group with a number of unique synapomorphies, such as the four-segmented antenna that lacks an antennal scale and the telson distinctly or indistinctly subdivided into several plates (the chirostyloid characters are considered plesiomorphic).

Composition. Chirostylidae Ortmann, 1892, Eumunididae A. Milne-Edwards & Bouvier, 1900, Kiwaidae Macpherson, Jones & Segonzac, 2005, Sternostylidae Baba, Ahyong & Schnabel, 2018.

Key to families of Chirostyloidea Ortmann, 1892

1. Mxps3 placed distantly from each other, bases not touching when Mxp3 is folded on itself; anterior thoracic sternite 3 clearly preceded by excavated sternum and anterior margin transverse or concave .... **Chirostylidae** Ortmann, 1892
– Mxp 3 bases placed close together, nearly touching when folded on themselves; anterior margin of thoracic sternite 3 medially projected, excavated sternum not visible in ventral view **2**
2. Eyes vestigial. Mandibular cutting edge chitinous. Sternite 3 strongly produced anteriorly to an acute point, obscuring mesial parts of Mxp3 bases .... **Kiwaidae** Macpherson, Jones & Segonzac, 2005
– Eyes well developed. Mandibular cutting edge calcified. Sternite 3 anterior margin not strongly produced to a narrow triangular point anteriorly, mesial parts of Mxp3 bases visible in ventral view **3**
3. Carapace with transverse striae. Supraocular spines present. Anterolateral margin of abdominal somite 2 with prominent, anterolaterally directed spine. Mxp 1 with epipod. Male pleopod 1 absent .... **Eumunididae** A. Milne-Edwards & Bouvier, 1900
– Carapace without transverse striae. Supraocular spines absent. Anterolateral margin of abdominal somite 2 without anterolaterally directed spine. Mxp1 without epipod. Male pleopod 1 present .... **Sternostylidae** Baba, Ahyong & Schnabel, 2018

Family **Chirostylidae** Ortmann, 1892

Chirostylidae Ortmann, 1892: 246 (part); 1898: 1149 (part); Alcock 1901: 278 (part); van Dam 1933: 2 (part); Barnard 1950: 495 (part); Balss 1957: 1594 (part); Davie 2002: 29 (part); Poore 2004: 220 (part); Baba *et al*. 2009: 7 (part); Schnabel & Ahyong 2010: 58 (part); Macpherson & Baba 2011: 48 (part); Baba *et al*. 2018: 78.

Diptycinés Milne-Edwards & Bouvier, 1894: 296, 312 (part); 1897: 116 (part).

Diptychinae Bouvier, 1896: 312 (part); Milne-Edwards & Bouvier 1897: 116 (part).

Uroptychidae Alcock, 1901: 236, 278 (part).

Diagnosis. Carapace without transverse setiferous striae. Rostrum triangular, spiniform or strongly reduced, supraocular spines absent. Sternal plastron with transverse or concave anterior margin preceded by excavated sternum (sternites 1–3). Abdominal somite 2 without anterolaterally produced spine on pleuron; tailfan folded beneath preceding abdominal somite, telson divided into anterior and posterior lobes. Eyes well developed. Antennal scale present or absent. Mxp1 without epipod, exopod flagellum smooth and non-annulated or absent. Mxps3 widely separated. P2–4 dactyli with articulated terminal spine. Two arthrobranchs on Mxp3 to pereopod 4; 1 arthrobranch on pereopod 5; 1 pleurobranch on each of P2–4. Male pleopods 1 and 2 present (Baba *et al*. 2018).

Composition. *Chirostylus* Ortmann, 1892, *Gastroptychus* Caullery, 1896, *Hapaloptyx* Stebbing, 1920, *Heteroptychus* Baba, 2018, *Uroptychodes* Baba, 2004, *Uroptychus* Henderson, 1888.

Remarks. With the exception of the poorly known genus *Hapaloptyx* (only known from South Africa and not in the key), all genera are reported here from the New Zealand region. The most diverse genus in this family, *Uroptychus*, continues to be subdivided, most recently into *Uroptychodes* Baba, 2004 and *Heteroptychus* Baba, 2018. Further division may be required as indicated by ongoing molecular investigations (Baba 2018, Baba *et al*. 2018).

Type genus. *Chirostylus* Ortmann, 1892, by monotypy.

Key to genera of Chirostylidae from New Zealand

1. Posterolateral margin of carapace strongly excavated. Anterior margin of sternite 3 straight transverse. Basal articles of ocular peduncles visible in dorsal view by short rostral base. Mxp 1 without flagellum .... ***Chirostylus*** Ortmann, 1892

– Posterolateral margin of carapace not distinctly defined or slightly excavated. Anterior margin of sternite 3 concave. Basal articles of ocular peduncles barely visible in dorsal view by presence of well-developed rostrum. Mxp 1 with flagellum **2**

2. Carapace with spines dorsally and laterally. Rostrum spiniform. Sternal plastron distinctly constricted between sternite 4 and 5 .... ***Gastroptychus*** Caullery, 1896

– Carapace may be spinose or smooth and unarmed. Rostrum flattish, narrowly or broadly triangular. Sternal plastron not distinctly constricted between sternite 4 and 5 .... **3**

3. P2 notably different in shape compared to P3–4, more slender than P3, dactylus entire or at most with fringe of fine spines or scales on flexor margin .... ***Uroptychodes*** Baba, 2004

– P2 similar to P3–4, as broad as P3, dactylus with spines on flexor margin (very rarely absent) **4**

4. Female sternal plastron strongly excavated on the posterior margin; sternites 5–7 medially discontinuous. Pterygostomian flap very low in the posterior half (the posterior height at most 0.3 × anterior height) .... ***Heteroptychus*** Baba, 2018

– Female sternal plastron not strongly excavated on posterior margin; sternites 5–7 entirely calcified. Pterygostomian flap proportionately high from anterior to posterior, rarely very low on posterior half .... ***Uroptychus*** Henderson, 1888

Genus ***Chirostylus*** Ortmann, 1892

Chirostylus Ortmann, 1892: 246; Miyake and Baba 1968: 379; Zariquiey Álvarez 1968: 261; Osawa and Nishikiori 1998: 386; Baba 2005: 15; Baba *et al*. 2008: 14 (list and synonymies); Baba *et al*. 2009: 8; Macpherson & Baba 2011: 48.

Diagnosis. Carapace dorsally smooth, with several prominent spines (rarely absent) or covered with numerous small spines; paired epigastric spines present; lateral margin strongly excavated on posterior portion. Rostral base short, convex, with or without median spine. Sternal plastron anterior margin usually transverse, rarely concave, with row of spines. Abdomen without transverse ridges, somite 2 without anterolateral pleural spine. Ocular peduncles elongate, basal part visible in dorsal view; cornea barely or slightly dilated. Antennal scale absent, flagellum short. Mxp 1 exopod without flagellum. P1–4 very slender, subcylindrical and spinose. P2–4 propodi very long relative to dactyli. G1 and G2 present (Baba *et al.* 2009).

Remarks. *Chirostylus* currently contains only seven species, all restricted to the Indo-West Pacific in primarily shallow waters, less than around 200 m. Two species are reported from New Zealand waters, one currently only known from a photograph (Fig. 8, Seafloor Image 1).

Type species. *Chirostylus dolichopus* Ortmann, 1892 by monotypy.

Chirostylus novaecaledoniae Baba, 1991

Figs 6, 7

Chirostylus novaecaledoniae Baba, 1991b: 464, figs 1, 8a; Baba 2005: 208 (synonymies, key); Baba *et al.* 2008: 14 (list and synonymies); Schnabel 2009b: 24 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 207 (list).

Type & locality (not examined). Holotype—MNHN-IU-2011-5905 (MNHN Ga-2069), 20°42.18′S, 167°00.40′E, Loyalty Islands, 270 m, male (pcl 4.8 mm).

Material examined. *West Norfolk Ridge (International Waters)*: NMNZ CR.025192, NZOI Stn E865, 32°41.00′S, 167°36.00′E, 168 m, 19 Mar 1968, 1 male (5.4 mm, pcl 4.9 mm).

Distribution. Loyalty and Chesterfield Islands, 236–170 m; West Norfolk Ridge, 168 m (Fig. 7).

Habitat. Members of *Chirostylus* are all distributed along the shallower continental shelf depths in the tropical and subtropical areas of the Indo-West Pacific region (to a maximum of 270 m, see summary by Schnabel *et al.* 2011). It can probably be assumed that all species are associated with corals, based on anecdotal evidence (Baeza 2011; Okuno & Osawa 2016; Wicksten 2020) and by the presence of the comb-like setae on the dactylus and propodus of the cheliped, which are similar to those in *Gastroptychus*. These have been linked to the host-association with the Atlantic deep-sea black coral *Leiopathes* (Le Guilloux *et al.* 2010) where the chelae were observed brushing through coral mucus and collecting food particles from nearby coral branches. The New Zealand specimen was collected together with a range of plexaurid and primnoid gorgonians (*Villogorgia* Duchassaing & Michelloti, 1860, *Metanarella* Cairns, 2012, *Perissogorgia* Bayer & Stefani, 1989), stylasterid corals, and large leptothecate hydrozoans (as well as other obligatory coral associates such as the brittle stars *Asteroporpa* Örsted & Lütken in Lütken, 1856 and *Ophiothrix* Müller & Troschel, 1840) and it is conceivable that this specimen used one or other of these cnidarians as a vantage point, similar to *C.* cf. *dolichopus* Ortmann, 1892 from the Kermadec Ridge discussed below.

Diagnosis. Rostral base convex on anterior margin, with small median spine barely reaching distal article of ocular peduncles. Gastric region with spine on posterior portion in addition to pair of epigastric spines. Spine on anterior part of cardiac region; row of 3 spines along posterior branchial margin anterior to posterolateral excavation. Anterior margin of sternite 3 without median sinus. Penultimate and ultimate spines of P2–4 dactyli subequal.

Colour in life. The coloration of the specimen examined is not reported but notes on coloration have been recorded for the holotype by Baba (1991b) as follows: body light carrot-orange, with scattered white spots laterally (on lateral sides of carapace and abdominal tergites). Carapace with white spotted line in large triangle. Eyestalks light reddish purple, cornea intensely black. Appendages light carrot-orange in background color, tinged with blue, with chromatophores or carrot-orange; distal parts of meri of pereopods intensely carrot-orange. Osawa (2007) showed the utility of live coloration to differentiate between species within this genus from Japan and it should always be recorded following collection and prior to preservation.

Remarks. This is the first comprehensive record of *Chirostylus* in New Zealand and the only specimen so far collected; the distribution of *C. novaecaledoniae* is extended from New Caledonia (Loyalty and Chesterfield Islands) southwards along the Norfolk Ridge into northern New Zealand waters.

The single specimen matches the description provided by Baba (1991b) well in terms of pereopod proportions and spination. Slight variations are as follows: the posterior branchial carapace region bears two spines on the left, four on the right in the present specimen, three or four (at most five) spines originally reported for the species; the anterior margin of sternite 3 bears rudimentary spines, instead of a line of six spines as reported by Baba (1991b); and the anterior margin of the pterygostomian flap is rounded and lacks a sharp spine anteriorly (Fig. 6).

Chirostylus novaecaledoniae is so far the only species of its genus known in the southwest Pacific and is most easily distinguished from other congeners by the arrangement of spines on the carapace: *C. sandyi* Baba, 2009 from the Philippines and central Indonesia (Sulawesi), has an unarmed carapace besides the paired anterolateral and epigastric spines; *C. stellaris* Osawa, 2007 and *C. ortmanni* Miyake & Baba, 1968 from Japan lack the central anterior branchial carapace spine; *C.*

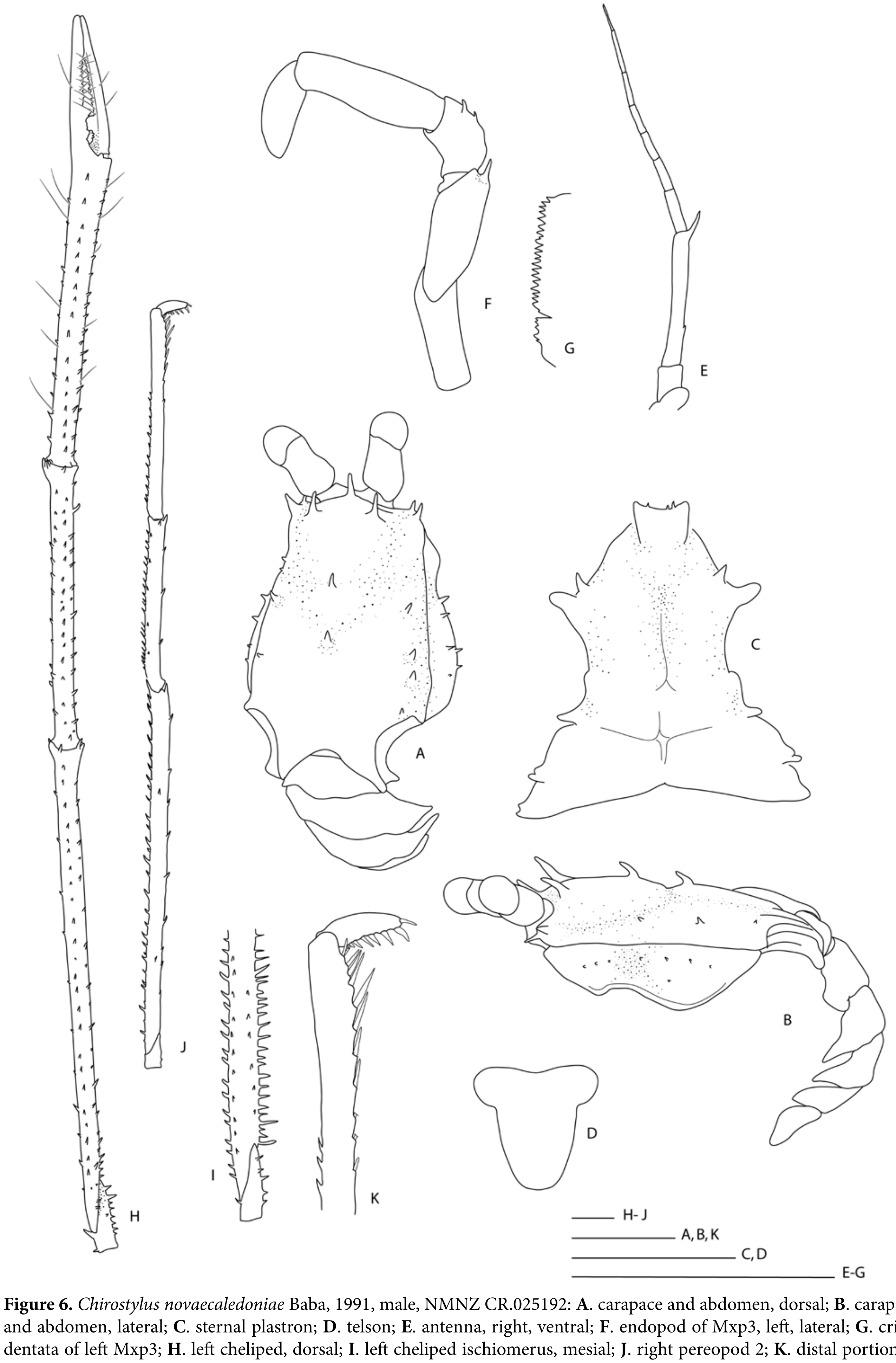


Figure 6. *Chirostylus novaecaledoniae* Baba, 1991, male, NMNZ CR.025192: **A**. carapace and abdomen, dorsal; **B**. carapace and abdomen, lateral; **C**. sternal plastron; **D**. telson; **E**. antenna, right, ventral; **F**. endopod of Mxp3, left, lateral; **G**. crista dentata of left Mxp3; **H**. left cheliped, dorsal; **I**. left cheliped ischiomerus, mesial; **J**. right pereopod 2; **K**. distal portion of propodus and dactylus, P2. Scale bars = 2 mm.

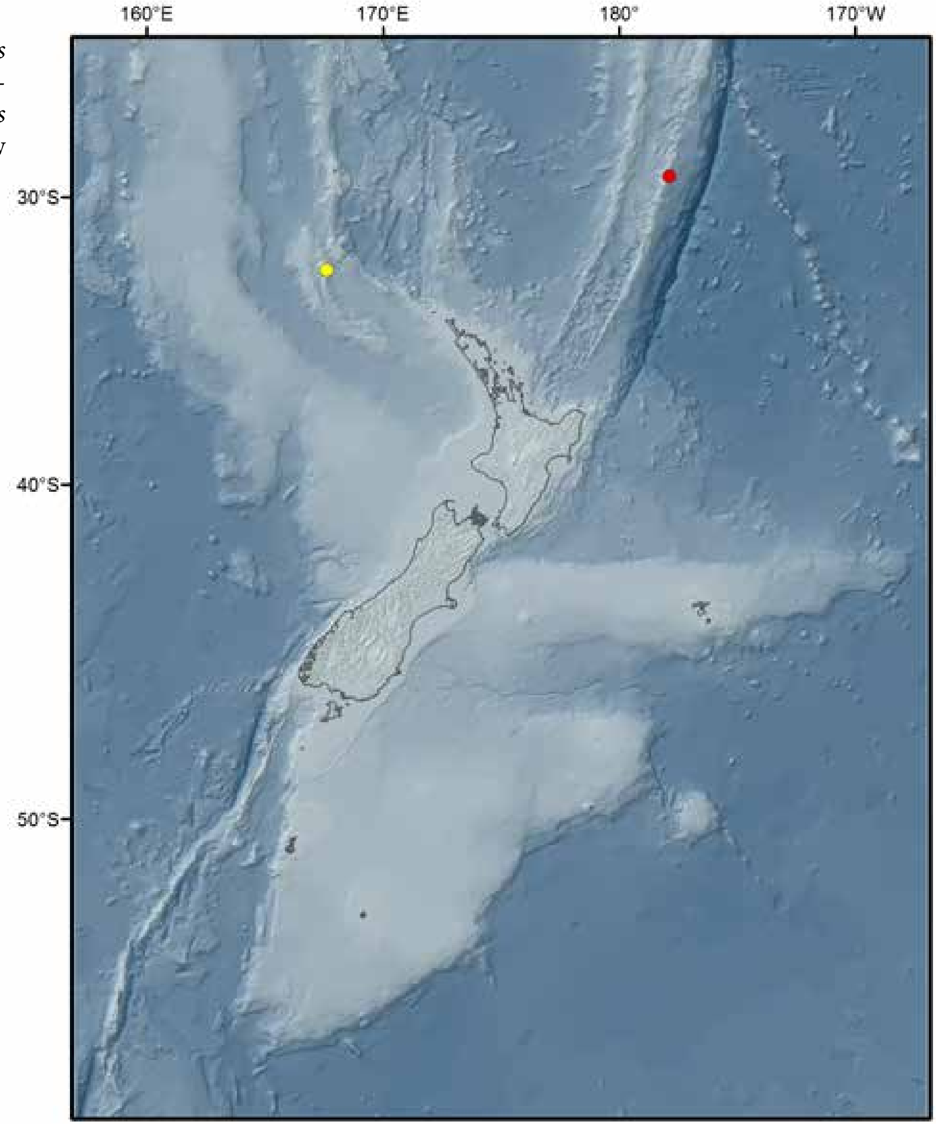


Figure 7. Distribution of *Chirostylus novaecaledoniae* Baba, 1991 (yellow) and *Chirostylus* cf. *dolichopus* Ortmann, 1892 (red) around New Zealand.

dolichopus Miyake & Baba, 1968, widely distributed throughout the Indo-Northwest Pacific, is unarmed dorsally and with only a single lateral branchial spine; and *C. rostratus* Osawa & Nishikiori, 1998 from Japan is lacking central branchial and cardiac spines, with the dorsal carapace only bearing a pair of epigastric spines (four lateral branchial spines are present, similar to *C. novaecaledoniae*).

Chirostylus cf. ***dolichopus*** Ortmann, 1892

Figs 7, 8; Seafloor Image 1

Chirostylus dolichopus Ortmann, 1892: 246, figs 2, 2b, c, e, i, o, z; Miyake 1960: 97, pl. 48, fig. 8; Miyake & Baba 1968: 381, figs 1a, b, 2; Takeda 1982: 49, fig. 147; Baba 2005: 16 (part), fig. 2; Baba *et al.* 2008: 14 (part, not fig. 1A); Okuna & Osawa 2016: 2, figs 1, 2.

Type & locality. Holotype—MZS 347, Kadsiyama (= Katsuyama), Sagami Bay, Japan, shallow water, male.

Other location (image only). A single specimen was photographed by Clinton Duffy, Department of Conservation, New Zealand, off the Meyer Islands, Kermadec Islands, 2 Nov 2008, approximately 29°14.7′S, 177°52.7′W, on SCUBA, at ~20–30 m (Fig. 7). No specimens were collected.

Distribution. Japan, 22–70 m; Kermadec Islands, ~20–30 m. Records from Somali Republic, Mozambique Channel, and Mauritius in the Western Indian Ocean (Baba 2005; Tirmizi & Khan 1979), Western Australia and Northern Territory, Australia (Ahyong & Baba 2004; Haig 1974) and Sulu Archipelago in the Philippines (Baba 1988) require confirmation. 35–238 m depth (Baba *et al.* 2008).

Habitat. Figure 8 shows an individual perching on a gorgonian coral, probably a species of Primnoidae, which aligns with previous reports of associations on 'octocorals' and 'colonies of fan-like gorgonaceans' (Okuno & Osawa 2016).

Diagnosis. Rostral lobe rounded, unarmed. Gastric and cardiac regions unarmed. Branchial regions armed each with one spine near anterior extremity of each cervical groove. Pterygostomian flap with a few to several spines. Thoracic sternite 3 with surface concave; anterior margin transverse, armed with 6 small spines.

Figure 8. *Chirostylus* cf. *dolichopus* Ortmann, 1892 photographed on gorgonian coral at Meyer Island, Kermadec Islands. Image courtesy of Clinton Duffy.

Abdominal somites with smooth dorsal surface. Ocular peduncle with feebly dilated cornea. Basal article of antennular peduncle with distolateral process bearing 3 or 4 spines. Dactyli of P2–4 each with 6–8 corneous spines on flexor margin, penultimate spine distinctly stouter than ultimate spine. (Emended from Baba [2005] and Okuno & Osawa [2016]).

Colour. Osawa (2007) and Okuno & Osawa (2016) emphasised the utility of live coloration as a diagnostic character in species identifications, although unfortunately, there is little information for most of the species described so far. The colour of the photographed specimen (Fig. 8) differs from that of *C. novaecaledoniae*, reported from the New Zealand region but most closely matches that of *C. dolichopus* Ortmann, 1892 as illustrated by Okuno & Osawa (2016) from freshly collected specimens from the type locality. This includes the shape of the dark and iridescent stripes on the carapace and pterygostomian flap and the position of white spots and dark red bands on the pereopods. These differ, for example, from the distinct red-white-red bands distally on the P2–4 meri of *C. ortmanni* and the absence of these clear markings in *C. stellaris* reported by Osawa (2007). However, the specimen photographed in New Zealand waters differs in that additional white markings are visible on the distal margin of at least the P4 carpus and that of the cheliped carpus. These are absent in *C. dolichopus* from Japan. Conversely, the Japanese specimens show additional dark red markings along the dorsal margins of at least some of the walking legs, which is not apparent in the New Zealand specimen.

Remarks. *Chirostylus dolichopus* has been widely reported across the Indo-West Pacific, but Okuno & Osawa (2016) provide cautionary comments suggesting a re-examination of the material outside Japan and indicate that *C. dolichopus sensu stricto* is likely restricted to Japanese and neighbouring waters. If Okuno & Osawa (2016) are correct, it is highly likely that the specimen photographed off Raoul Island represents an undescribed species.

Genus ***Gastroptychus*** Caullery, 1896

Ptychogaster A. Milne-Edwards, 1880: 63; Henderson 1888: 170 (part); Alcock 1901: 280 (part).

Gastroptychus Caullery, 1896: 390 (replacement name for *Ptychogaster* A. Milne-Edwards, 1880, junior homonym of *Ptychogaster* Pomel, 1847 (Reptilia: Chelonia, fossil)); Miyake & Baba 1968: 379 (part); Poore 2004: 221 (part); Baba 2005: 19 (part); Macpherson & Baba 2011: 49 (part); Baba *et al*. 2018: 79.

Chirostylus, Zariquiey Alvarez, 1968: 261 (part); van Dam 1933: 12 (part).

Diagnosis. Carapace with spines dorsally and laterally, dorsal surface lacking transverse striae; lateral orbital spine present or absent; posterior lateral margin weakly or barely excavated. Rostrum spiniform, basal part subtriangular. Anterior margin of sternite 3 feebly or strongly concave with two or more spines, preceded by excavated sternum (fused sternites 1–3); sternite 4 with strong lateral spine on each side; sternal plastron distinctly constricted between sternite 4–5 (hourglass-shaped), posterolateral margin of sternite 4 concave. Antennal peduncle slender, scale present or absent. Incisor margin of mandible serrate. Mxp1 exopod with smooth, non-annulated flagellum. Pereopods 1–4 long and slender, with numerous spines usually arranged in longitudinal rows (Baba *et al.* 2018).

Remarks. With the establishment of the new genus and family, *Sternostylus* and Sternostylidae, *Gastroptychus* was recently redefined to accommodate 12 species of the '*G. formosus*' form, using both morphological and molecular evidence (Baba *et al.* 2018). The diagnosis of *Gastroptychus sensu stricto* was modified accordingly and includes a new character highlighting the distinct constriction between sternites 4 and 5 and the concave posterolateral margin of sternite 4, which gives an hourglass shape to the sternal plastron.

Gastroptychus sensu stricto currently contains nine species distributed across all major oceans. Only one species of *Gastroptychus* is found in New Zealand. The large species previously reported as *Gastroptychus rogeri* has been referred to *Sternostylus*.

Type species. *Ptychogaster spinifer* A. Milne Edwards, 1880.

Gastroptychus novaezelandiae Baba, 1974

Figs 9–12; Seafloor Images 2–6

Gastroptychus novaezelandiae Baba, 1974: 381, figs 1, 2 ; Baba 2005: 214 (synonymies, key); Baba *et al.* 2008: 23 (list and synonymies); Schnabel 2009a: 544, figs 2, 3; Schnabel 2009b: 24 (list); Rowden *et al.* 2010: 73 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 207 (list).

Gastroptychus spp., Ahyong *et al.* 2011b: 168, fig. colour photo, whole animal.

Type & locality (not examined). Holotype—ZLKU 15123, FV *Kaiyo Maru* Stn 28, 43°14.5′S, 174°43.0′E, Chatham Rise, 440 m, 13 Jul 1968, male (cl 11.5 mm).

Material examined. Measurements are given as cl only.

Northland Plateau: NMNZ CR.014301, CR.023672, CR.023673, CR.023674, CR.023675, CR.023676, CR.023677, T31, 35°27′S, 175°6.00′E, Hauraki Gulf, N point of Tauwhiti Rahi 263°, Mokohinau Light 165°, 369–384 m, Northern Prawn Cruise 1969, 10 Jan 1969, 8 specimens (not measured); NIWA 88558, NIWA Stn TAN9915/37b, 35°39.73′S, 175°33.15′E, 348 m, 19 Dec 1999, 2 males (10.2, 11.0 mm); NIWA 26574, NIWA Stn KAH9401/12, 36°14.29′S, 176°12.13′E, 350–379 m, 7 Jan 1994, 1 female ov. (14.3 mm); NIWA 85525, NIWA Stn KAH1205/67, 36°4.15–7.14′S, 176°12.76–13.00′E, 349–364 m, 23 Mar 2012, 2 females ov. (12.8 mm and 1 damaged), 2 females (9.2 mm and 1 damaged), 5 males (16.7, 16.3, 15.2, 12.5 mm and 1 damaged); NIWA 88559, NIWA Stn KAH1205/67, 36°4.15–7.14′S, 176°12.76–13.00′E, 349–364 m, 23 Mar 2012, 1 male (15.0 mm); NIWA 85536, NIWA Stn KAH1205/66, 36°17.30–20.25′S, 176°07.60–06.78′E, 318–337 m, 23 Mar 2012, 1 female ov. (13.7 mm).

Bay of Plenty and Hikurangi Margin: NIWA 14568, NIWA Stn Z8994, 37°20.19′S, 176°22.40′E, 297 m, 19 Jan 1998, 1 female ov. (19.2 mm); NMNZ CR.014294, Marine Department Haul 10, 36°55′S, 176°15′E, 366 m, 26 Sep 1962, 1 male (14.4 mm); NMNZ CR.025181, VUW Stn T29, 36°57′S, 176°17′E, 468–457 m, 9 Jan 1969, FV *Yankee Doodle*, 1 female (15 mm); AKM MA101517, AKM Stn K414/71, 36°56′S, 176°15′E, Aldermen Islands, 284–302 m, 30 Nov 1971, 1 female (15.9 mm, pcl, 12.3 mm), 2 males (15.2, 14.3 mm, pcl 11.2, 10.7 mm); NMNZ CR.023671, VUW Stn T6, 37° 2.000′ S, 176° 13.000′ E, Slipper Island Light 202°, Ohena Island Light 296°, 293–256 m, Northern Prawn Cruise 1969, 01 Jan 1969, 1 specimen (not measured); AKM MA101530, AKM Stn 2/6/6, 37°26′S, 176°26′E, 375–384 m, 06 Jun 1979, 1 female (16.4 mm, pcl 11.9 mm), 1 male (14.0 mm, pcl 11.3 mm); AKM MA101548, 37°28′S, 176°27′E, south of Mayor Island, 384 m, 11 Jul 1979, 2 males (broken rostrum, 15.9 mm, pcl 13.5, 12.0 mm); AKM MA3152, 37°31′S, 176°32′E, 348–366 m, 08 Jun 1979, 1 male (15.7 mm, pcl 11.7 mm); AKM MA120894, 37°32′S, 176°36′E, 366–384 m, 07 Jun 1979, 1 female (12.4 mm, pcl 9.5 mm); AKM MA3207, 37°36′S, 176°37′E, off Mayor Island, 347.5–384.1 m, 09 Jun 1979, 1 female (13.4 mm, pcl 10.3 mm); AKM MA101531, 37°36′S, 176°34′E, 366–475 m, 06 Jun 1979, 1 male (12.8 mm, pcl 9.5 mm); AKM MA3138, 37°38′S, 176°44′E, 311–381 m, 08 Jun 1979, 1 male (15.7 mm, pcl 12.1 mm); AKM MA3093, 37°37′S, 176°45′E, 357–403 m, 07 Jun 1979, 1 female ov. (11.8 mm, pcl 8.6 mm), 1 female (11.6 mm, pcl 8.0 mm), 1 male (13.3 mm, pcl 10.0 mm); NIWA 127128, RV *Sonne* Stn SO254/34ROV09, 37°30.11′S, 178°46.27′E, north of Gisborne, 535.5 m, 08 Feb 2017, collected by GEOMAR ROV *KIEL 6000*, onboard RV *Sonne*, ICBM expedition SO254, 1 female ov. (14.0 mm).

Challenger Plateau: NIWA 33732, NIWA Stn TAN0707/91, 39°51.20–55.40′S, 169°20.53–20.17′E, 523–526 m, 04 Jun 2007, 1 male (10.8 mm); NIWA

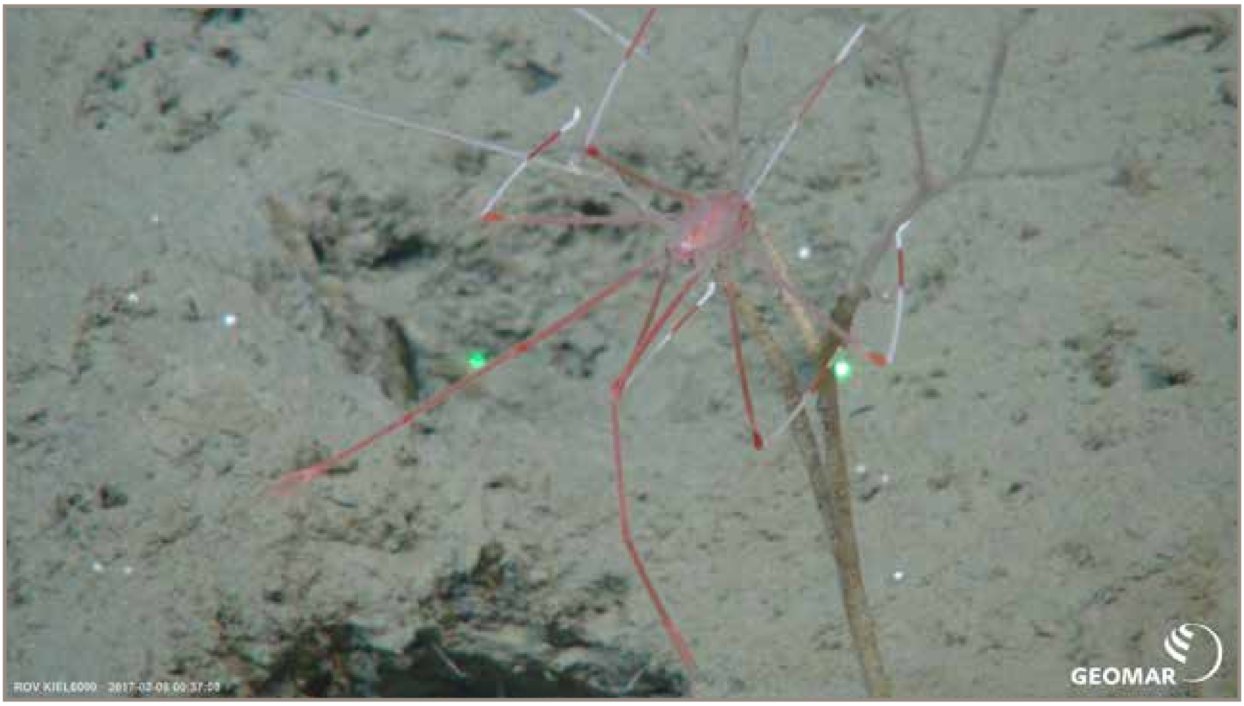


Figure 9. *Gastroptychus novaezelandiae* Baba, 1991 *in situ* off the East Cape, PoriBacNewZ Stn SO254_34ROV09, perched on a carnivorous sponge, probably *Asbestopluma*. The laser points are 6.24 cm apart. Image courtesy of ROV *KIEL 6000* GEOMAR, PoriBacNewZ ICBM.

33733, NIWA Stn TAN0707/91, 39°51.20–55.40′S, 169°20.53–20.17′E, 523–526 m, 04 Jun 2007, 1 male (9.3 mm); NMNZ CR.015235, NZOI Stn E907, 38°39.00′S, 172°40.00′E, North West Slope Benthos, RV *Taranui*, 322–323 m, 28 Mar 1968, 2 females ov. (13.3, 13.0 mm, pcl 10.4, 9.5 mm); NMNZ CR.005915, RV *W.J. Scott* Stn 659/2, 40°51.850′S, 171°5.100′E, NW of Westport, 450–459 m, 28 Oct 1982, 1 specimen (not measured).

Cook Strait: NMNZ CR.014293, CR.023664, CR.023665, CR.023666, VUZ Stn 17, 41°31.00′S, 174°58.00′E, Palliser Bay, E of Cape Turakirae, 457 m, 13 May 1955, 4 specimens (not measured); NMNZ CR.023667, CR.023668, CR.023669, CR.023670, VUW Stn T28, Victoria University Zoology Department, 1955, 4 specimens (not measured).

Chatham Rise: NIWA 24590, NIWA Stn TAN 1001/134, 42°57.96′S, 175°49.59′E m, 27 Jan 2010, 1 male (12.2 mm); NIWA 90624, NIWA Stn KAH1308/59, 42°59.86–43°02.60′S, 176°34.60–32.87′E, 430–407 m, 06 Oct 2013, 1 female ov. (13.7 mm); NIWA 33675, NIWA Stn TAN0705/118, 43°47.31–47.74′S, 175°15.13–14.77′W, 520–532 m, 12 Apr 2007, 1 male (5.6 mm); NIWA 33670, NIWA Stn TAN0705/116, 43°59.86–44°28.02′S, 175°27.84–27.36′W, 411–413 m, 12 Apr 2007, 1 female ov. (17.5 mm; sequenced, see Fig. 5); NMNZ CR.025182, NZOI Stn C608, 43°19.00′S, 179°00.00′E, 450–465 m, 27 Apr 1961, 1 female (11.1 mm); NMNZ CR.014297, NZOI Stn D871, 43°19.99′S, 178°40.00′W, 454 m, 24 Mar 1969, 4 female ov. (10, 10.3, 11.6, 14.8), 1 female (8.4 mm), 4 males (8.6, 10.5, 12.5, 14.1 mm); NMNZ CR.025183, DM TINRO Stn 332, 43°22′S, 174°30′E, 480 m, 4 Jul 1971, RV *Alba*, Vladivostok, 1 male (12.5 mm); NMNZ CR.025184, NZOI Stn G259, 43°32.99′S, 179°22.00′E, 419 m, 23 Jan 1968, 1 female (14.7 mm); NMNZ CR.025185, NZOI Stn G388, 43°34.99′S, 178°03.00′W, 384 m, 6 Feb 1968, 1 female (8.1 mm); NMNZ CR.014300, DM TINRO Stn 417, 43°48.9′S, 176°06.1′E, 440 m, 21 Jul 1971, RV *Alba*, Vladivostok, 1 male (17.0 mm); NMNZ CR.025186, NZOI Stn D90, 43°49.99′S, 179°00.00′W, 399 m, 17 May 1963, 1 female (12.8 mm); NMNZ CR.025187, NZOI Stn D899, 44°22.99′S, 176°49.00′W, 370 m, 29 Mar 1969, 2 males (6.6, 9.7 mm).

Otago Shelf: NIWA 74757, NIWA Stn TAN1108/117, 45°53.93–53.95′S, 171°26.40–29.90′E, 197–215 m, 23 May 2011, 1 male (9.3 mm); NMNZ CR.015251, PMBS Stn Mu67−142, 45°52′S, 171°02′E, 732 m, 30 Nov 1967, 2 female ov. (10.2, 10.2 mm), 4 females (8.4, 8.6, 8.9, 9.2 mm), 2 males (8.4, 11.7 mm); NMNZ CR.025188, NZOI Stn G696, 46°18.49′S, 170°34.49′E, 680 m, 21 Jan 1970, 1 male (10.9 mm); NMNZ CR.012071, NZOI Stn G697, 46°19.50′S, 170°41.99′E, 528 m, 21 Jan 1970, 6 female ov. (10.0, 10.8, 11.4, 12.0, 12.8, 13.0 mm) 2 female (7.5, 8.6 mm), 8 males (8.9, 9.7, 10.2, 10.3, 10.3, 11.1, 11.7, 13.1 mm); NMNZ CR.014296, PMBS Stn Mu73–376, Papanui Canyon D, 732 m, 30 Nov 1973, 8 specimens (not measured).

Subantarctic New Zealand Region, *Bounty Plateau*: AM P.102315 (ex NIWA 14635), NIWA Stn TAN0307/67, 48°14.83′S, 179°29.28′E, 282–283 m, 30 Apr 2003, 1 female ov. (11.2 mm), 1 female (12.5 mm), 1 male (12.2 mm).

Figure 10. *Gastroptychus novaezelandiae* Baba, 1974, 1 male, cl 15.0 mm, NIWA 88559.

Subantarctic New Zealand Region, *Solander Trough*: NIWA 76199, NIWA Stn TAN1106/5, 46°32.38–32.39′S, 166°26.67–26.69′E, 542–530 m, 13 Apr 2011, 1 female ov. (14.2 mm; sequenced, see Fig. 5).

Subantarctic New Zealand Region, *Puysegur Bank*: NMNZ CR.014299, NZOI Stn E818, 46°20.29′S, 166°19.00′E, 461–466 m, 23 Oct 1967, 1 male (11.7 mm).

No location information. NMNZ CR.025189, Stn NZ DOM 549 TOWZ, 25 Dec 1991, 1 female (17.5 mm).

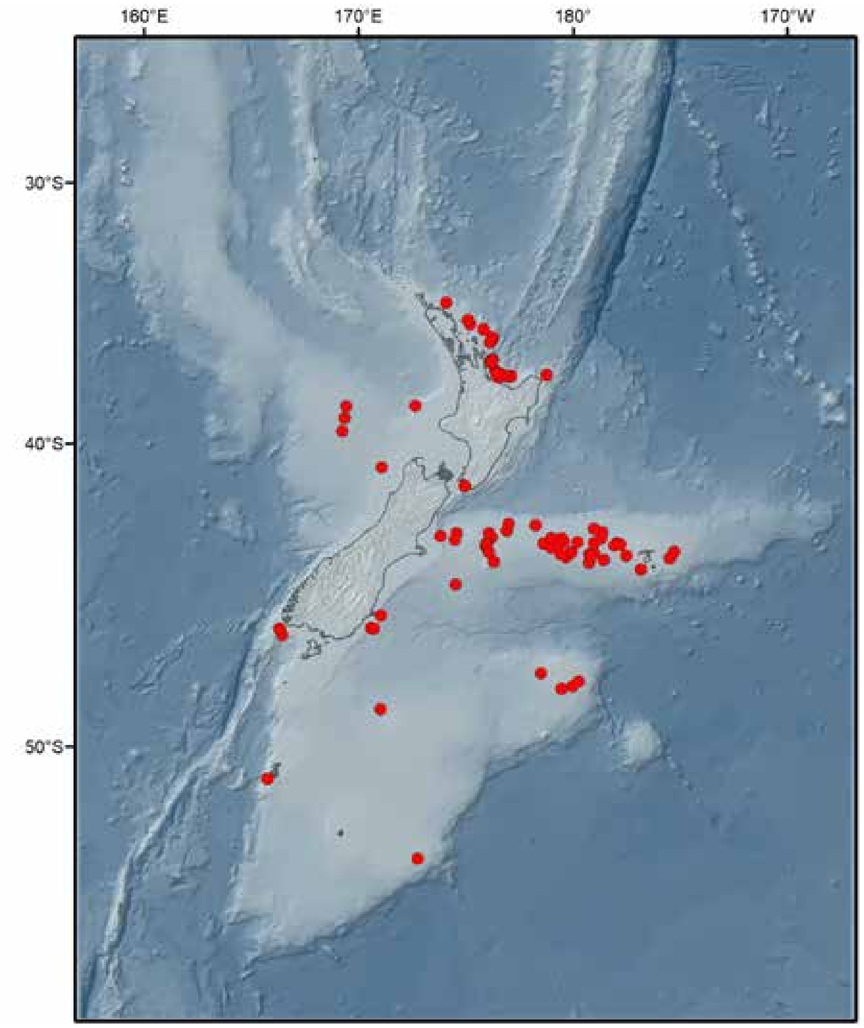
Distribution. Widespread around New Zealand: Northland Plateau, Bay of Plenty, Chatham Rise, Otago Shelf, Bounty Plateau, Campbell Plateau, off Auckland Islands, Puysegur Bank, Challenger Plateau, 130–768 m (Fig. 12).

Habitat. *Gastroptychus novaezelandiae* is particularly common on the Chatham Rise and the holotype was "taken from a dorsal groove of *Balticina willemoesii* (Kölliker)" (Baba 1974), a pennatulid that is now accepted as *Halipteris willemoesi* Kölliker, 1880. *In situ* observations have shown *G. novaezelandiae* perched on a cladorhizid sponge (Fig. 9, Seafloor Image 2), small octocorals (Isididae, bamboo corals, see Seafloor Image 3), or directly on the soft sediments (Seafloor Images 5, 6). It appears that *G. novaezelandiae* is not an obligatory associate of other sessile species but uses available structural organisms opportunistically as vantage points.

Diagnosis. Carapace 1.7–1.8 × as long as wide (including rostrum), covered with spinules and spines (paired spines on epigastric region and directly anterior of posterior margin, 1 median metagastric spine, 2 spines along midline of cardiac region and 4 or 5 strong spines along lateral branchial region, decreasing in size posteriorly). Rostrum with large, procurved dorsal spine. Anterior margin of sternite 3 concave with row of 6–8 spines. Sternite 4 with one pair of large lateral spines; surface with scattered small spines and granules only. Abdomen covered with spines; pair of large submedian spines on anterior portions of somites 1–6 each; telson anterior portion covered with denticles. Antennal scale small and triangular, barely reaching midpoint of article 4, rudimentary or absent; article 5 with distal spine; article 4 unarmed. Mxp3 propodus with 2–5 spines along extensor margin; ischium with 33 teeth on crista dentata (including 2 or 3 strong teeth on basis). Cheliped slender, palm 2.4–3.0 × as long as dactyli. P2–4 carpi 7–8 × longer than propodi.

Figure 11. *Gastroptychus novaezelandiae* Baba, 1977; B, D, E, F, holotype, male, ZLKU 15123 (modified after Schnabel, 2009); A, C, G, H, male, NIWA 88559: **A**. carapace and abdomen, dorsal; **B**. carapace and abdomen, lateral; **C**. sternal plastron, ventral; **D**. telson; **E**. antenna, right and left, ventral; **F**. Mxp3 crista dentata, right; **G**. Mxp3 endopod, right, lateral; **H**. distal carpus, propodus and dactylus, left P3. Scale bars = 2 mm.

Figure 12. Distribution of *Gastroptychus novaezelandiae* Baba, 1974 around New Zealand.



Colour in life. Body has light orange base colour with small areas of darker pigmentation on ocular peduncle, gastric region, and along midline of abdomen; small darker spots on lateral portions of abdominal somites. Chelipeds slightly darker orange base colour than walking legs which can appear near transparent. Distal portions of meri with small distinctly red bar each; distal portion of cheliped similarly pigmented. Walking legs with wide red bar in distal half of carpi (Ahyong *et al.* 2011b, Fig. 9, *in situ* image of *G. novaezelandiae* perched on an *Asbestopluma* Topsent, 1901, a carnivorous sponge in family Cladorhizidae Dendy, 1922).

Remarks. The endemic *G. novaezelandiae* is the most common chirostylid in New Zealand, being present on the entire continental shelf (Fig. 12). Schnabel (2009a) recorded 115 specimens, and around 70 further specimens were examined here, listed under the additional material examined.

The morphological variation of the new material of *G. novaezelandiae* presented here, falls within the range of size and pereopod proportions reported by Schnabel (2009a). The presence and position of the major spines on the dorsal surfaces of the carapace and abdomen are stable and diagnostic. The small male collected from the Chatham Rise (NIWA 33675) is the smallest specimen observed so far at cl 5.6 mm, and the largest specimen is the ovigerous female (NIWA 14568) at cl 19.2 mm. As indicated previously, the antennal scale is usually rudimentary, but ranges from distinct to absent (compare Fig. 11E left v. right).

One male (NIWA 85525, cl 12.5 mm) and another (NMNZ CR.025189, previously reported by Schnabel (2009a)) lack the dorsal rostral spine which is otherwise characteristic of this species. One further specimen of *G. novaezelandiae* (NIWA 88558, male, cl 11.0 mm) had a sacculinid rhizocephalan attached to the abdomen.

Gastroptychus novaezelandiae belongs to the group of three species in this genus with the P2–4 propodi less than 0.2 × length of the carpi (Fig. 10). These are *G. brachyteres* Baba, 2005 (Kei Islands, Indonesia) and *G. brevipropodus* Baba, 1991 (New Caledonia) but *G. novaezelandiae* can be readily distinguished from both of these species by the dorsal spine on the rostrum, the pronounced paired submedian spines on the abdominal tergites 1–6, at least two spines on the extensor margin of the propodus of the Mxp3 and the absence of prominent submedian spines on the thoracic sternite 3 (only scattered granules and very small spines along sternite 4).

Baba *et al.* (2018) indicate that this group of three species might be sufficiently distinct to unite them into a separate genus, and preliminary molecular data seems to support this (see below).

DNA sequence data. Intraspecific sequence divergence for partial CO1 gene: 1.2% (NIWA 33670, NIWA 76199). Interspecific sequence divergences: 18.5% (*G.* sp. 3804, Genbank accession number KF051395, Roterman *et al.* 2013); however, this species is placed remotely in the tree (Fig. 5).

Genus ***Heteroptychus*** Baba, 2018

Heteroptychus Baba, 2018: 570.

Diagnosis. Carapace dorsal surface smooth and glabrous, much wider than long, lateral margin strongly convex posteriorly, with anterolateral spine only, rarely with 1 or 2 processes along branchial region. Rostrum narrowly or broadly triangular. Pterygostomian flap very low on posterior half, height of posterior half 0.1–0.3 × that of anterior half. Sternal plastron different in sexes, posterior margin in females strongly excavated, with median parts of sternites 5–7 absorbed into sternite 4 (left and right parts of sternites 5–7 discontinuous, interrupted by loss of median parts). Antennal scale articulated or fused with article 2, not reaching distal end of article 4, articles 4 and 5 unarmed. Cheliped ischium with anterior dorsal process lobe-like or spiniform, posterior process usually lobe-like (rarely obsolescent); fingers distally spooned, marginally tuberculate occlusal margins. P4 very short, especially carpus 0.3–0.5 × length of P3 carpus. Distal two articles of P2–4 with long prehensile margins thickly fringed with setae, dactyli with slender spines perpendicular to flexor margin. G1 and G2 present (Baba 2018).

Remarks. *Heteroptychus* was established recently by Baba (2018) for a distinctive group of species with unique sexual dimorphism in the shape of the sternal plastron. The female sternal plastron is very wide and strongly excavated at its posterior margin, with the sternites 5–7 medially interrupted and not calcified. Males, however, show a sternal morphology more typical of *Uroptychus*, the shape of the pterygostomian flap is also much lower in the posterior half (at most 0.3 × the anterior height), the P4 is much shorter than P2–3, and the carpi of the walking legs are distinctly prehensile. Baba (2018) established six new species, driven by apparent molecular differences indicating a species complex. However, morphological differences are slight and characters variable, and Baba (2018) concluded that extensive studies are required. *Heteroptychus* now contains nine species.

Heteroptychus scambus (Benedict, 1902), the type species of the genus, was until recently considered widely distributed in the Indo-West Pacific. Following Baba's (2018) review, *H. scambus* is now known with certainty only from Japan and Taiwan, with material from the area immediately to the north of New Zealand (such as New Caledonia, Fiji, and the Norfolk Ridge) referred to three other species. Differences between these species are primarily based on whether the antennal scale is articulated with the antennal article 2 or not and whether the rostrum is narrow or spiniform.

Records of *Uroptychus scambus* from New Zealand (Schnabel 2009a) are referred to possibly four species of *Heteroptychus* which are supported by interspecific levels of molecular divergence using the CO1 gene (Fig. 5). The reference specimens that were examined by Schnabel (2009a) from *Galathea* Stn 453 from Indonesia (ZMUC CRU-11506) are referable to *H. lemaitrei* Baba, 2018. Of the remaining 15 specimens, 14 are referable to *H. colini* Baba, 2018 and one to *H. claudeae* Baba, 2018. Seven further specimens have been examined herein, of which two specimens are morphologically most similar to *H. claudeae* but are clearly genetically distinct.

Examining the range of material available highlights the limitations of diagnostic characters and a thorough review of the morphological and molecular diversity of this genus is needed.

Type species. *Heteroptychus scambus* (Benedict, 1902).

Heteroptychus claudeae Baba, 2018

Figs 13–15A, 15B, 16, 17

Uroptychus scambus, Baba 1981: 120; Baba 1988: 43; Baba *et al.*

Key to species of *Heteroptychus* from New Zealand

1. Antennal scale fully or at least partially articulated with antennal article 2, apex reaching or overreaching mid-length of antennal article 4 .... ***Heteroptychus colini*** Baba, 2018
– Antennal scale fused with antennal article 2, short, apex barely reaching or overreaching distal point of article 3 .... ***Heteroptychus claudeae*** Baba, 2018

2009: 59 (part), figs 49–51; Schnabel 2009a: 567 (part); Schnabel 2009b: 30 (list, part); Webber *et al.* 2010: 225 (list, part); Rowden *et al.* 2010: 13 (list, part); Yaldwyn & Webber 2011: 201 (list, part).

Heteroptychus claudeae Baba, 2018: 580, figs 292–294.

Type & locality (not examined). Holotype—MNHN-IU-2013-8571, MUSORSTOM 7 Stn CP564, 11°46′S, 178°27′W, Wallis and Futuna Islands, 1015–1020 m, male (pcl 5.0 mm).

Material examined. *Raoul Island*: AKM MA124690 (ex NIWA 115198), Kermadec-Rangitahua Stn TAN1612/30, 29°17.89–18.22′S, 177°47.39–47.71′W, 1311–1320 m, 25 Oct 2016, 1 female ov. (6.3 mm, pcl 4.7 mm; sequenced, see Fig. 5), 1 male (5.5 mm, pcl 4.1 mm).

East Cape: NIWA 44725, NZOI Stn E724, 37°23.30′S, 178°0.50′E, 645 m, 24 Mar 1967, 1 female ov. (5.4 mm, pcl 4.5 mm).

Hikurangi Trough: NIWA 16707, NZOI Stn R439, 39°26.80–27.40′S, 178°19.99–18.40′E, 1000–800 m, 16 Jun 1990, 1 male (5.3 mm, pcl 4.1 mm).

Status uncertain. *Heteroptychus* cf. *claudeae* Baba, 2018: NIWA 118629, Kermadec-Rangitahua Stn TAN1612/71, 30°17.01–17.41′S, 178°11.82–12.03′W, Macauley Island, 1431–1426 m, 29 Oct 2016, 1 female ov. (7.0 mm, pcl 5.4 mm; sequenced, see Fig. 5), 1 male (6.0 mm, pcl 4.5 mm).

Distribution. Widespread southwest Pacific: Japan, Taiwan, Indonesia, Wallis and Futuna Islands, Chesterfield Islands, Solomon Islands, New Caledonia, Vanuatu, Loyalty Ridge, Norfolk Ridge, and Tonga, 331–1240 m (Baba 2018); Kermadec Ridge, Bay of Plenty, and Hikurangi Margin, 645–1320 m. *Heteroptychus* cf. *claudeae* was collected off Macauley Island, 1431–1426 m (Fig. 17).

Habitat. Baba (2018) indicates an association of this species with *Chrysogorgia* Duchassaing & Michelotti, 1864 gold coral. Wicksten (2020) reports *in situ* photographs of *H.* cf. *claudeae* on primnoid corals in the Central Pacific. Direct observations for the New Zealand material are unavailable; *Chrysogorgia* was collected at the same station for the two most recently collected (TAN1612) samples, the remaining two stations contain records for other large octocorals such as bamboo corals.

Diagnosis. Carapace lateral margin entirely smooth. Rostrum and anterolateral spines sharply pointed but more or less depressed distally (not spiniform). Sternite 3 anterior margin broadly excavated, with small (rarely obsolescent) median notch, with or without small submedian spines. Antennal scale fused or mostly fused with antennal article 2, short, barely reaching or overreaching distal point of article 3. Cheliped ischium with posterior dorsal lobe distinct (not obsolescent), may overhang basis.

Colour in life. Previously illustrated by Baba *et al.* (2009: figs 49, 50), pale pink base colour of body, anterior part of carapace darker, red and pereopods intermediate pink.

Remarks. *Heteroptychus claudeae* belongs to the group in the genus with the antennal scale fused to the article 2 and was established on the basis of slight morphological differences that distinguish it from the two other species in this group. *Heteroptychus claudeae* is distinguished from *H. brevis* (Benedict, 1902), which has a distally blunt rostrum and anterolateral spines and an obsolescent posterior lobe on cheliped ischium only (versus a sharply pointed rostrum and anterolateral spine and a distinct posterior lobe on the cheliped ischium in *H. claudeae*) and from *H. lemaitrei* Baba, 2018, which has a small protuberance at the anterior end of the branchial carapace lateral margin and a spiniform rostrum (versus an entirely smooth carapace lateral margin and a 'more or less' depressed rostrum distally in *H. claudeae*). Baba (2018), however, noted that this supposedly widespread species (currently known from Japan, Indonesia to New Zealand) probably itself represents a species complex that clearly displays variable morphological characters (see Baba 2018: 583, fig. 294).

One large female (AKM MA124690) was successfully matched with paratypes of *H. claudeae* using CO1 sequences (see below) and is fully illustrated (Fig. 13). Some aspects of the smaller male are also illustrated in Fig. 15. Morphological variation includes the length of the rostrum, which clearly overreaches or barely reaches the end of the peduncle (e.g. NIWA 16707), while it does not reach, or only barely overreaches the peduncle, in the type series. The lateral orbital spines are small and distinct on both sides of the holotype but are absent (NMNZ CR.012089 and AKM MA124690) or differ from right to left on the same specimen (NIWA 16707). The angle of the deflection of the rostrum varies as does the relative angle of deflection of the anterolateral spine and anterior pterygostomian flap spine (Figs 15A, B). These characters were considered to be possibly diagnostic.

The articulation of the antennal scale is not always clear and is a difficult diagnostic character to use, but the scale appears to be mostly fused in *H. claudeae* and a suture appears to be more visible in *H. colini,* although the articulation appears to be rarely complete (see Fig. 16 for the comparative morphology of the antenna for 11 specimens). In addition to the degree of articulation, however, the size and shape of the

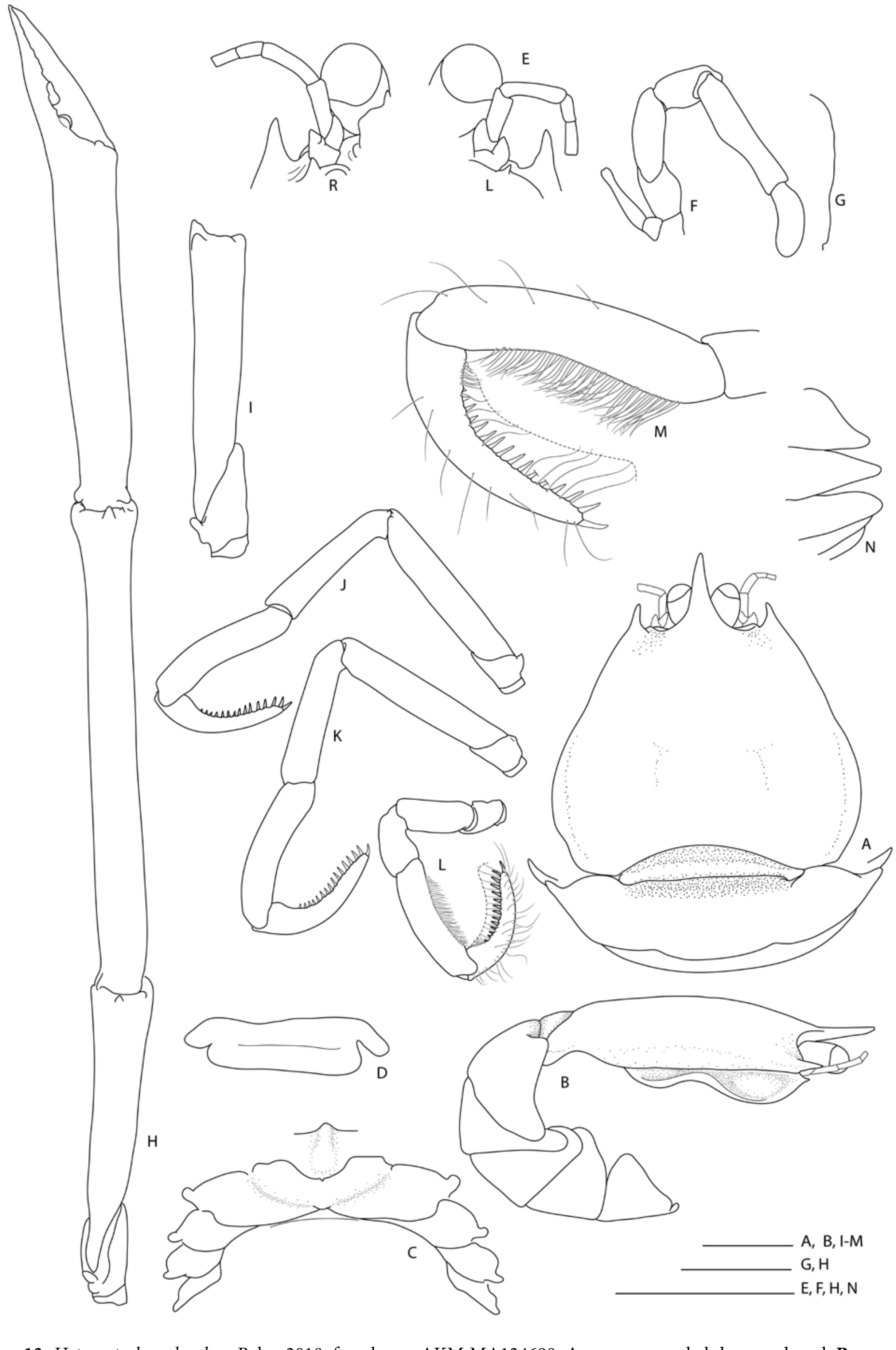


Figure 13. *Heteroptychus claudeae* Baba, 2018, female ov., AKM MA124690: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** right and left anterolateral carapaces, antennas and ocular peduncles, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of right Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J.–L.** left P2–4; **M.** distal portion of carpus, propodus and dactylus, P2; **N.** right pleura of abdominal somites 2–6, dorsolateral. Scale bars = 2 mm.

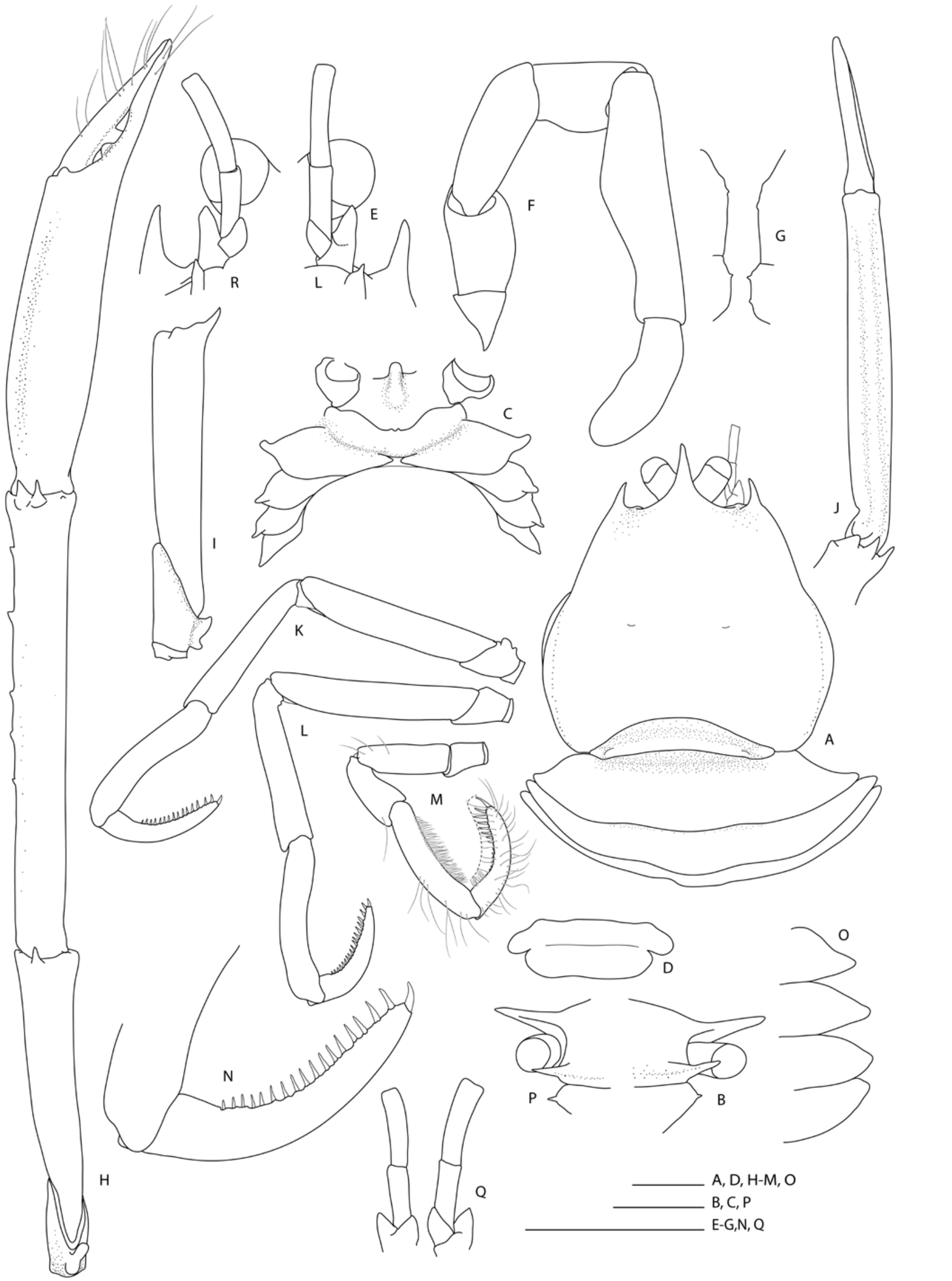


Figure 14. *Heteroptychus* cf. *claudeae* Baba, 2018, A–O, female ov., P–Q, male, NIWA 118629: **A.** carapace and abdomen, dorsal; **B**, **P.** anterior portion of carapace and pterygostomian flap, lateral; **C.** excavated sternum, Mxp3 coxa and sternal plastron, ventral; **D.** telson; **E.**, right and left anterolateral carapaces, antennas and ocular peduncles, ventral; **F.** right endopod of Mxp3, right, lateral; **G.** crista dentata of right and left Mxp3; **H.** right cheliped, dorsal; **I.** right cheliped ischiomerus, mesial; **J.** right cheliped distal carpus, palm and fingers, mesial; **K**–**M.** left P2–4; **N.** distal portion of carpus, propodus and dactylus, P2; **O.** right pleura of abdominal somites 2–5, dorsolateral; **Q.** left and right antennas, ventral. Scale bars = 2 mm.

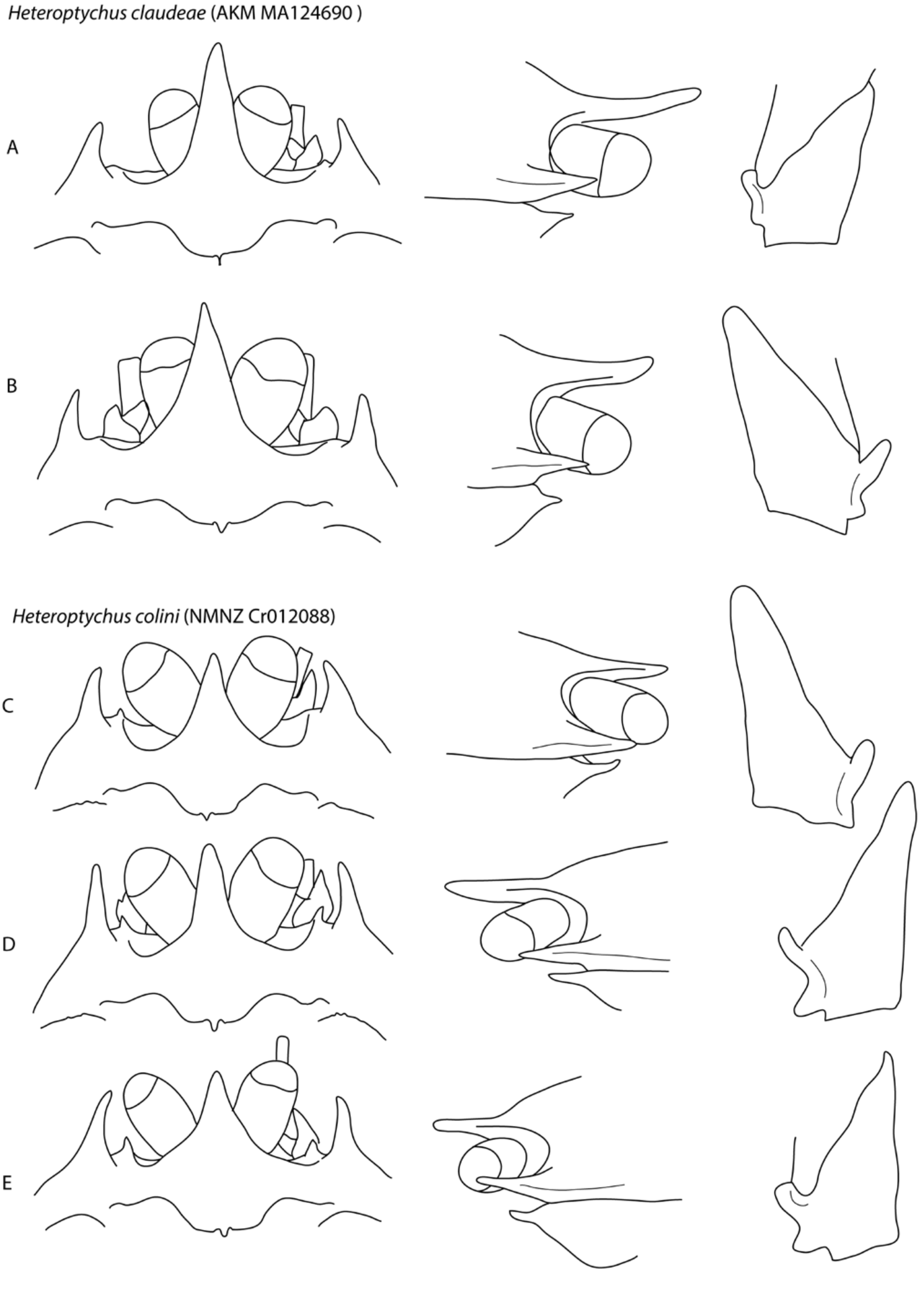


Figure 15. Comparative morphology of anterior carapace and anterior margins of sternites 3 and 4 (left column), anterior carapace and pterygostomian flap, lateral view (middle column) and mesial view of cheliped ischium (right column); A, B, *Heteroptychus claudeae* Baba, 2018, AKM MA124690; C–E, *H. colini* Baba, 2018, NMNZ CR.012088: **A.** female ov., 4.7 mm; **B.** male, 4.1 mm; **C.** male, 3.7 mm, **D.** male, 4.1 mm, **E.** female ov., 4.0 mm. Not to scale.

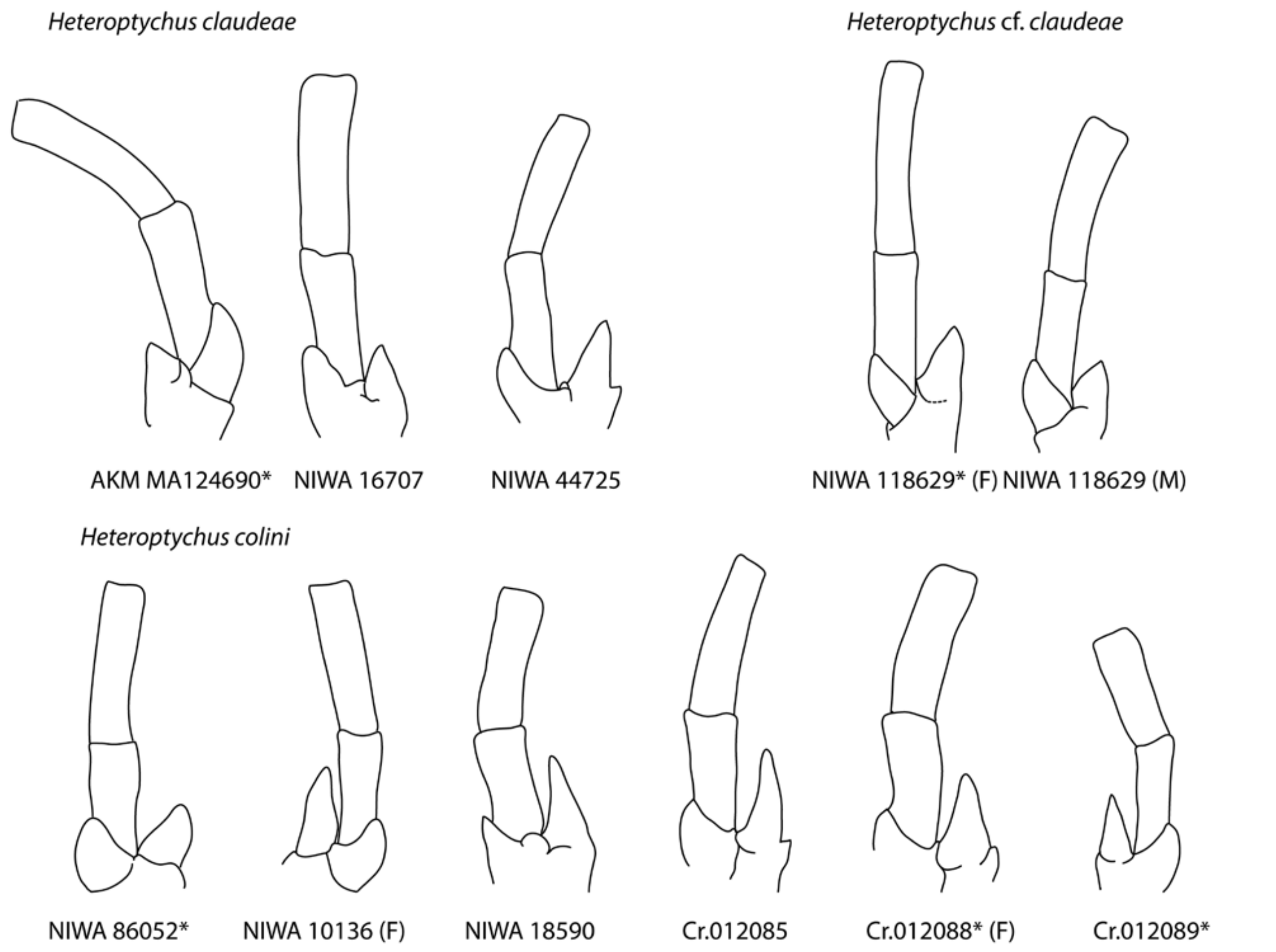


Figure 16. Comparative morphology of the antenna for 11 specimens of *Heteroptychus claudeae*, *H*. cf. *claudeae* Baba, 2018, and *H. colini* Baba, 2018. Asterisks indicate where specimens were successfully sequenced, and brackets indicate whether the male (M) or female (F) from a sample was illustrated.

antennal scale was used herein to identify species. *Heteroptychus claudeae* has a short antennal scale that barely reaches the distal point of the basal antennal article 3, a character present in the holotype, but this character should be checked for consistency across the remaining type material. In contrast, *H. colini* has an antennal scale that is comparatively longer, overreaching article 3 and typically distally narrowing to an acute triangular point.

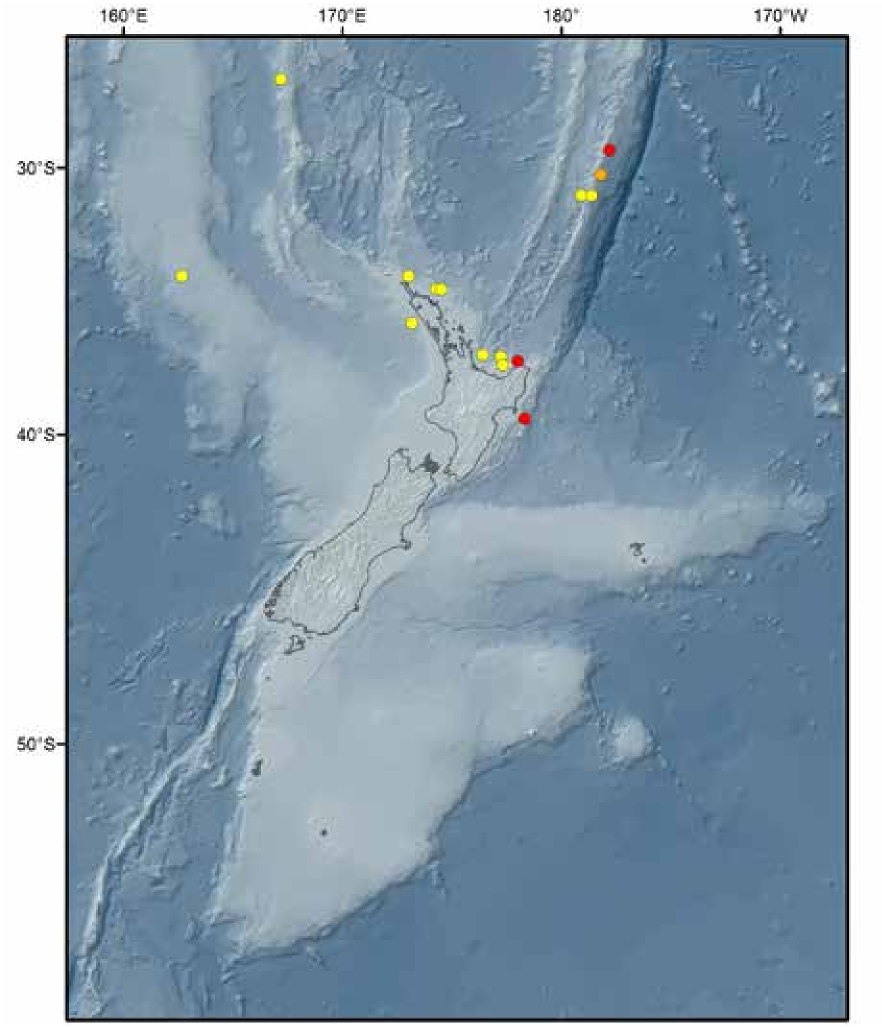
Baba (2018) used the shape of the posterodorsal lobe on the cheliped ischium as a diagnostic character, but the degree of variation of this character does not allow for the separation of New Zealand specimens (Fig. 15). The posterodorsal lobe on the P1 ischium distinguishes the New Zealand specimens from *H. brevis*, which only has an obsolescent posterior lobe.

One pair of specimens (NIWA 118629) collected in 2016 from over 1400 m depth east of Macauley Island is genetically distinct from all other species of *Heteroptychus* sequenced to date, with divergences that would normally be considered interspecific (see below). Morphologically, however, these specimens appear indistinguishable from *H. claudeae,* with which it appears most closely aligned (Fig. 14). This is based on the short and mostly fused antennal scale, the acute rostrum and anterolateral spines, the entirely smooth lateral carapace margin, and the presence of a distinct proximal lobe on the cheliped ischium dorsally.

These two specimens (NIWA 118629) represent the deepest record for New Zealand *Heteroptychus* by about 100 m. The only other species of *Heteroptychus* collected at >1400 m so far is the holotype of *H. lemaitrei* from the Norfolk Ridge (MNHN-IU-2013-12289, Baba 2018). The two specimens are also the largest male and female from New Zealand (pcl 5.4 and 4.5 mm, for female and male, respectively), but this lies within the range reported for *H. claudeae* by Baba (2018).

Very slight variation in the pair (NIWA 118629) observed is the smaller-than-usual anterior spine on the pterygostomian flap, which is typically pronounced and often curved in other species. In the female, this spine is very small, although in the male it is distinct (compare Figs 14B, 14P). The lateral orbital spine is absent, and the rostrum is strongly upturned in both

Figure 17. Distribution of *Heteroptychus claudeae* Baba, 2018 (red), *H.* cf. *claudeae* (orange) and *H. colini* Baba, 2018 (yellow) around New Zealand.



specimens and the anterolateral spine is strongly upturned in lateral view in the female but directed more horizontally in the male. The lateral crest on the cheliped palm is more pronounced on the large female than on all the other material examined across the genus, but this might be simply related to the size. Overall, the morphology is too similar and our knowledge of the range of variation in these species is still too poor to enable accurate evaluation of the significance of the observed differences.

DNA sequence data. Intraspecific sequence divergence for partial CO1 gene: AKM MA124690 matches four paratype sequences of *H. claudeae* collected on the Norfolk Ridge and Wallis and Futuna Islands (L. Corbari, pers. comm.). Interspecific sequence divergences: 6.4–6.9% (*H. colini*, six specimens), 7.3% (*H.* cf. *claudeae*, NIWA 118629).

Heteroptychus colini Baba, 2018

Figs 15C–E, 16–20

Uroptychus scambus, Schnabel 2009a: 567 (part); Schnabel 2009b: 30 (list, part); Webber *et al.* 2010: 225 (list, part); Rowden *et al.* 2010: 13 (list, part); Yaldwyn & Webber 2011: 201 (list, part); Roterman *et al.* 2013: 5, fig. 3 (phylogeny).
Heteroptychus colini Baba, 2018: 586, figs 296, 297.

Type & locality (not examined). Holotype—MNHN-IU-2014-17126, MUSORSTOM 7 Stn CP552, 12°16′S, 177°28′W, Wallis and Futuna Islands, 786–800 m, 18 May 1992, male (pcl 4.3 mm).

Material examined. *Kermadec Ridge*: NIWA 18590, NIWA Stn TAN0205/48, 31°05.25–05.41′S, 179°05.40–04.78′W, 1129–944 m, 19 Apr 2002, 1 male (5.5 mm, pcl 4.1 mm); NIWA 86052, NIRVANA Stn TAN1213/16, 31°S 6.09–6.15′S, 178°36.88–37.22′W, 834–825 m, 16 Oct 2012, 1 female ov. (5.7 mm, pcl 4.7 mm; sequenced, see Fig. 5).

Norfolk Ridge (Australian EEZ): NMNZ CR.012088, NORFANZ Stn TAN0308/43, 26°25.93–25.99′S, 167°10.87–09.64′E, 750–774 m, 18 May 2003, 1 female ov. (5.0 mm, pcl 4.0 mm; sequenced, see Fig. 5), 2 males (5.1, 4.6 mm, pcl 4.1, 3.7 mm; small male sequenced, see Fig. 5).

Lord Howe Rise (International Waters): NMNZ

Figure 18. *Heteroptychus colini* Baba, 2018, female ov., pcl 4.7 mm, NIWA 86052, Stn TAN1213/16.

CR.012089, NORFANZ Stn TAN0308/82, 34°12.43′S, 162°39.49′E, 760–758 m, 26 May 2003, 1 female (3.5 mm, pcl 2.7 mm; sequenced, see Fig. 5).

Northland Plateau: NIWA 10145, NZOI Stn I368, 34°12.79′S, 173°01.30′E, 452–460 m, 23 Nov 1977, 1 female (broken rostrum, pcl 3.4 mm); NIWA 10136, NZOI Stn I366, 34°42.30′S, 174°17.59′E, 705–684 m, 20 Nov 1977, 1 female ov. (5.0 mm, pcl 3.9 mm), 1 male (4.5 mm, pcl 3.5); NMNZ CR.012085, NZOI Stn F913, 34°43.49′S, 174°31.49′E, 743 m, 11 Oct 1968, 1 female ov. (5.3 mm, pcl 4.0 mm); NMNZ CR.012086, NZOI Stn E884, 35°58.99′S, 173°10.00′E, 701–689 m, 23 Mar 1968, 1 male (3.8 mm, pcl 2.9 mm).

Bay of Plenty: NIWA 10198, NIWA Stn TAN0413/591 37°12.54–12.96′S, 177°14.25–14.20′E, 910–701 m, 11 Nov 2004, 1 female ov. (4.7 mm, pcl 4.1 mm; sequenced, see Fig. 5); NMNZ CR.023725, NZOI Stn R113, 37°09.10–10.60′S, 176°24.40–26.60′E, 753–826 m, 23 Jan 1979, 1 female ov. (5.1 mm, pcl 3.9 mm); NMNZ CR.012087, VUW 'Haul 13', 37°32′S, 177°20′E, 732 m, 30 Sep 1962, 1 female ov. (4.8 mm, pcl 4.0 mm), 1 female (5.3 mm, pcl 4.2 mm), 1 male (5.1 mm, pcl 4.0 mm).

Distribution. Fiji Islands, Wallis and Futuna Islands, Norfolk Ridge, 353–860 m; Lord Howe Rise, southern Norfolk Ridge, Kermadec Ridge, Northland Plateau, and Bay of Plenty, 452–1129 m (Fig. 17).

Habitat. Unknown, but many specimens were collected during seamount surveys and it is presumed that this species is similarly associated with octocorals as other species of *Heteroptychus*.

Diagnosis. Carapace lateral margin entirely smooth. Rostrum reaching or slightly overreaching the eye; narrow triangular in dorsal view. Anterolateral spine of carapace not overreaching apex of rostrum. Antennal scale articulated with antennal article 2. Sternite 3 with median notch flanked by distinct or indistinct submedian spines.

Ovum. Female NIWA 10136 carried 14 eggs, diameter 1.2–1.6 mm, female NIWA 86052 carried 31 eggs, diameter 1.1–1.4 mm, female NMNZ CR.023725 carried 16 eggs, 1.3–1.4 mm diameter.

Colour in life. Anterior portion (carapace, chelipeds, at least the first two walking legs) pale pink, dark pink pigmentation in gastric region of carapace and rostrum (Fig. 18).

Remarks. According to the key to species of *Heteroptychus* (Baba 2018), the present material most closely aligns with *H. colini* Baba, 2018, based on the antennal scale being (mostly) articulated with antennal article 2, the branchial carapace margin being smooth (*H. apophysis* Baba, 2018 bears two processes), the anterolateral spine falling short of the apex of the rostrum (in *H. anouchkae* Baba, 2018 the anterolateral spine overreaches the rostrum), the rostrum in most cases overreaching the ocular peduncle (it always falls

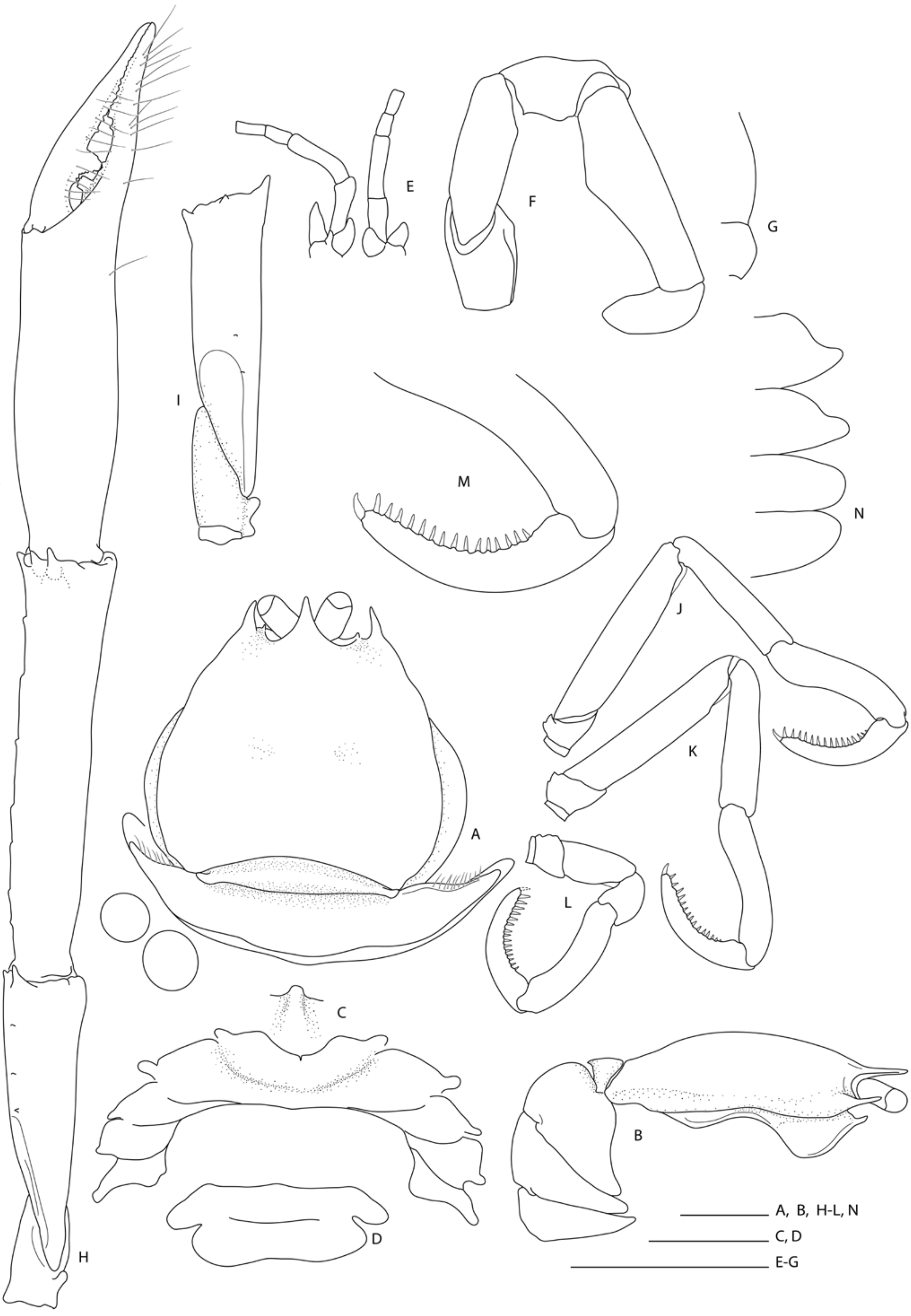
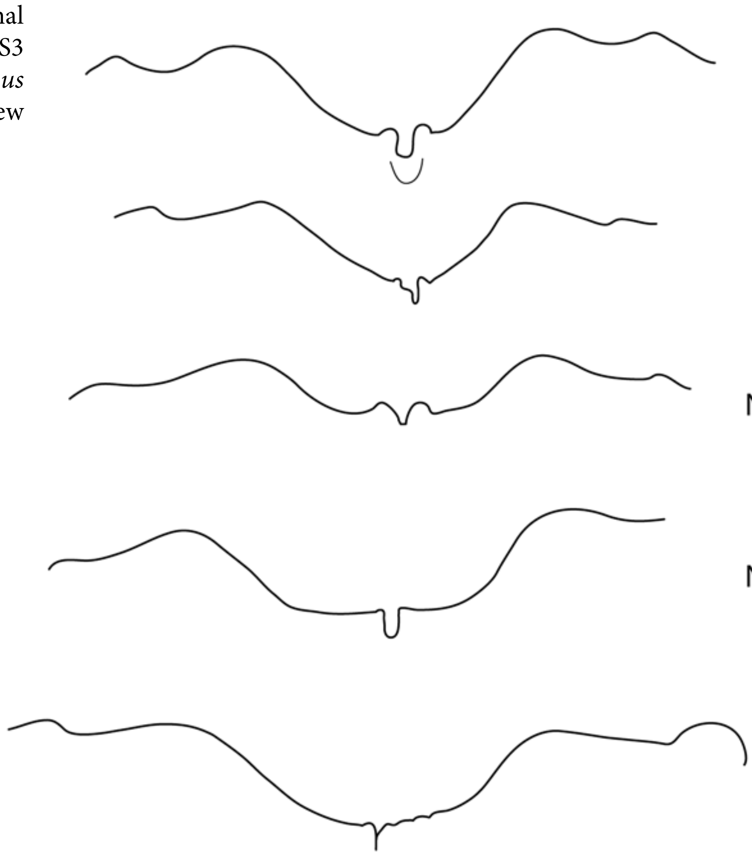


Figure 19. *Heteroptychus colini* Baba, 2018, female ov., NIWA 86052: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antennal peduncles, right and left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of right Mxp3; **H.** right cheliped, dorsal; **I.** right cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, P2, lateral; **N.** right pleura of abdominal somites 2–5, dorsolateral. Scale bars = 2 mm.

Figure 20. Comparative sternal morphology, anterior margin of S3 for five specimens of *Heteroptychus colini* Baba, 2018 collected in New Zealand (not to scale).



short of the apex of the eye in *H. scambus*), and the rostrum being narrowly triangular (the rostrum is broadly triangular in *H. scambus* and distally blunt in *H. paulae* Baba, 2018). The final couplet of Baba's (2018) key distinguishes between *H. colini* and *H. edwardi* (Kensley, 1981), using the rostral shape in dorsal view (narrow triangular or spiciform, respectively) and the anterior margin of the sternite 3 (with a pair of median processes or with median notch and no median processes, respectively). The material examined here has a narrowly triangular rostrum but shows some variability with regards to its length, falling short to slightly overreaching the ocular peduncle (Fig. 15 illustrates the rostrum for three specimens from the same locality). The anterior sternal morphology varies, ranging from distinct submedian spines to a very small submedian notch without flanking spines, which closely resembles the sternum illustrated for *H. edwardi* (Fig. 20). Baba (2018: 583, fig. 294) illustrated the variability observed in the anterior part of the sternal plastron for *H. claudeae* and its use as a diagnostic character will have to be considered more closely in the future. *Heteroptychus scambus sensu stricto* is currently known only from Japan and Taiwan; *H. edwardi* is restricted to the South African coast; and *H. colini* has been described from just north of New Zealand. The material examined here is from the northern New Zealand continental shelf and the Kermadec Ridge, and it is reasonable to assume *H. colini* extends into this area.

Unfortunately, no reference CO1 sequence data for *H. scambus sensu stricto* was available from the MNHN (Corbari, pers. comm.) and although new sequence data aligns with sequences deposited in GenBank as *Uroptychus scambus* (KF051396, Roterman *et al.* 2013), this sequence is based on tissue extracted from NIWA 10198 provided to the authors and examined here. Until new material becomes available, and/or more distinguishing characters are being considered for this group, this material is referred to as *H. colini*. Five specimens previously reported as *Uroptychus scambus* by Schnabel (2009a) are referrable to *H. colini*.

Heteroptychus colini was described from three male specimens from north of New Zealand and a similar depth range; this is the first record of females of *H. colini* (Figs 19, 20; NIWA 86052), including the smallest record (NMNZ CR.012089, pcl 2.7 mm) compared to 3.6–4.5 mm (Baba 2018).

The New Zealand specimens of *H. colini* match the type description well with regards to meristics and spination. Slight variations to add are the length of the rostrum, which ranges from just falling short of the ocular peduncle (e.g. NIWA 86052, Fig. 19) to slightly overreaching the eyes (NIWA 10145). Also, the lateral limit of the orbit is angular and acuminate for the type series but ranges from a distinct spine (e.g. NMNZ CR.012086) to a rounded angle (e.g. ex NMNZ CR.012087) in the New Zealand material (see

Figs 15C–E). Sexual dimorphism is distinct, with the sternum depressed for the females (median height of the sternite is about 0.2 the entire width) but the cheliped length (6.0–6.5 × pcl) and proportions falling within the range reported for the males. The distodorsal process on the cheliped ischium is distinct and, in most cases, lobed but less so in NIWA 86052 (Fig. 19). The cheliped carpus clearly bears one or two distinct dorsal spines terminally and the palm is weakly ridged. This variation matches closely that observed for *H. claudeae*, also reported from New Zealand. The sole difference apparent between these two species is the presence or absence of an articulated antennal scale which, in some cases, is difficult to observe (Fig. 16, and see comments under *H. claudeae* above). Unfortunately, in most cases the specimens are too old to conduct molecular analyses to ascertain whether specimens can be confidently assigned. There is clearly a need to establish constant and diagnostic morphological characters for species within this species complex.

The small male of *H. colini* collected between 944–1129 m on the Kermadec Ridge (NIWA 18590) extends the depth distribution from 860 to possibly around 1100 m depth.

The small female (NMNZ CR.012089) has a small kentrogonid rhizocephalan under its abdomen.

DNA sequence data. Intraspecific sequence divergence for partial CO1 gene: 0.2–0.5% (six specimens). Interspecific sequence divergences: around 7% (*H. claudeae*, and *H.* cf. *claudeae*).

Genus ***Uroptychodes*** Baba, 2004

Uroptychodes Baba, 2004: 98; Baba 2005: 26; Baba *et al.* 2008: 25; Baba *et al.* 2009: 25; Macpherson & Baba 2011: 49.

Diagnosis. Body and appendages usually covered with fine setae. Carapace armed with row of lateral spines. Rostrum basally broad but elongate, often more than length of remaining carapace, ventral surface carinate in midline. Orbital margin concave, distinct in dorsal view. Excavated sternum with carinate ridge in midline. Abdominal somite 2 pleuron anterolaterally rounded, not produced into spine. Sternal plastron not constricted between sternites 4–5; sternite 4 posterolateral margin straight or convex (not concave). Eyes short. Antennal scale present, flagellum short, not extending beyond end of rostrum. Incisor margin of mandible serrate. Mxp 1 exopod with flagellum. Mxp3 ischium with distinct spine lateral to rounded flexor distal margin. Cheliped relatively slender, spinose or covered with denticular small spines. P2 distinctly more slender than P3–4, carpus longer than that of P3–4, dactylus unarmed or with slender spines or scales on flexor margin; P3–4 dactyli with row of spines on flexor margin, penultimate broader than ultimate and antepenultimate. G1 and G2 present (modified from Baba *et al.* 2009).

Remarks. The genus *Uroptychodes* is abbreviated *Ud.* from here onwards, throughout this work to distinguish it from the genus *Uroptychus* (*U.*).

Twelve species of *Uroptychodes* are known from the Western Pacific, with the most recent range extensions provided by Baba *et al.* (2009) from Taiwan, and Dong & Li (2010) describing *Ud. babai* from the East China Sea. *Uroptychodes spinimarginatus* (Henderson, 1885), was described from off the Kermadec Islands based on material collected by the H.M.S. *Challenger* in 1874. New material for *Ud. spinimarginatus* and one further species, *Ud. epigaster* Baba, 2004 are presented here for the New Zealand region.

The diagnosis is expanded here, Baba (2004) and later diagnoses referred to the P2 dactylus as "usually unarmed" but specimens of both species examined here bear small spines or scales along the flexor margin.

Type species. *Uroptychodes epigaster* Baba, 2004.

Key to species of *Uroptychodes* from New Zealand

1. Carapace with paired epigastric spines; antennal article 5 with small distal spine; Mxp3 carpus with spines along extensor margin; extensor margins of propodi of P3–4 armed with spines ....***Ud. epigaster*** Baba, 2004
– Dorsal carapace surface unarmed; antennal article 5 unarmed distally; Mxp3 carpus unarmed along extensor margin; extensor margins of propodi of P3–4 unarmed .... ***Ud. spinimarginatus*** (Henderson, 1885)

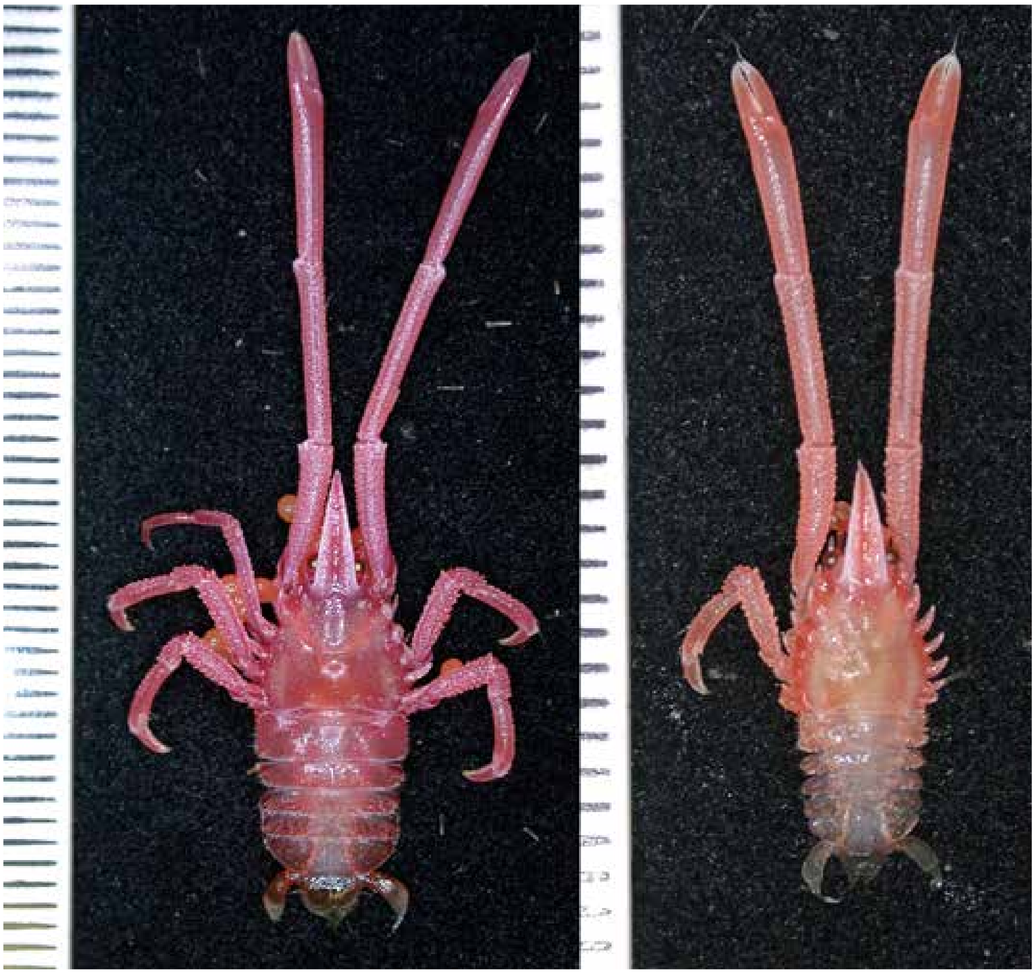


Figure 21. *Uroptychodes epigaster* Baba, 2004: left, NIWA 34811, female; right, NMNZ CR.021766, male. Both from NORFANZ Stn TAN0308/126. Note the rhizocephalan (parasitic barnacles) infestation (orange globes) on pereopods on left specimen.

Uroptychodes epigaster Baba, 2004 Figs 21–23

Uroptychodes epigaster Baba, 2004: 104, fig. 5; Baba 2005: 215 (synonymies, key); Baba *et al*. 2008: 25 (list and synonymies); Schnabel 2009b: 25 (list) —Webber *et al*. 2010: 225 (list); Yaldwyn & Webber 2011: 207 (list).

Type & locality (not examined). Holotype—MNHN-IU-2019-2559 (MNHN Ga-4581), 22°57.6´ S, 167°33.0´ E, New Caledonia, 410–440 m, female (pcl 5.6 mm).

Material examined. *South Norfolk Ridge*: NIWA 42390, NORFANZ Stn TAN0308/136, 33°23.59–23.43′S, 170°12.37–11.74′E, 469–490 m, 1 Jun 2003, 3 males (9.5, 8.9, 6.1 mm, pcl 4.8, 4.4, 3.0 mm; 4.4 mm male sequenced, see Fig. 5); NMNZ CR.021766, NORFANZ Stn TAN0308/126, 33°23.59–23.43′S, 170°12.37–11.74′E, 469–526 m, 31 May 2003, 2 males (7.5, 6.6 mm, pcl 3.8, 3.5 mm); NIWA 34811, NORFANZ Stn TAN0308/126, 33°23.59–23.43′S, 170°12.37–11.74′E, 469–526 m, 31 May 2003, 1 female (not measured).

Distribution. Norfolk Ridge, from New Caledonia to New Zealand, 410–700 m (Fig. 23).

Habitat. Unknown, so far only collected on seamounts and deep-sea ridges.

Diagnosis. Carapace dorsally spineless other than one distinct pair of epigastric spines, small pair of hepatic spines may be present; lateral margin with one hepatic and 5 or 6 prominent branchial spines. Rostral lateral margin nearly entirely smooth, with a few distal serrations only. Abdomen unarmed. Antennal scale falling short of or reaching approximately midlength of the ultimate article; articles 4 and 5 with small distal spine each. Cheliped and all walking legs (P1–4) covered with tubercular spines. P3–4 propodi with spines at least along proximal extensor margin; dactyli with distal 2 of flexor marginal spines prominent and subequal.

Colour in life. The entire body is a deep orange to pink colour, which is darker along the lateral margin of the carapace and abdomen and along the midline of the carapace. Figure 21 shows the largest male specimen of NIWA 34811 (examined from photo only) including the rhizocephalan infestation on the left.

Remarks. Slight variation of the New Zealand specimens from the type description is noted as follows:

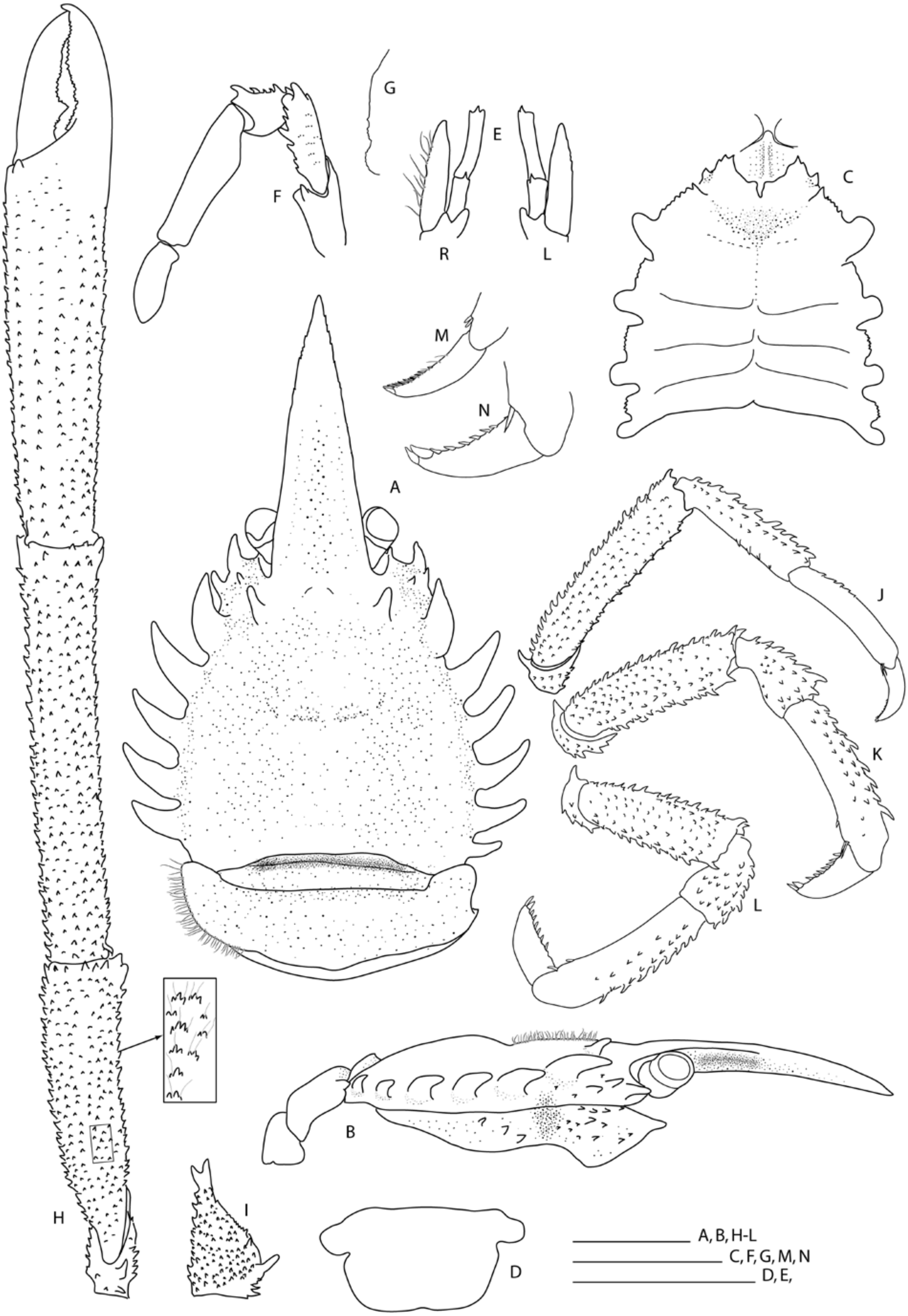
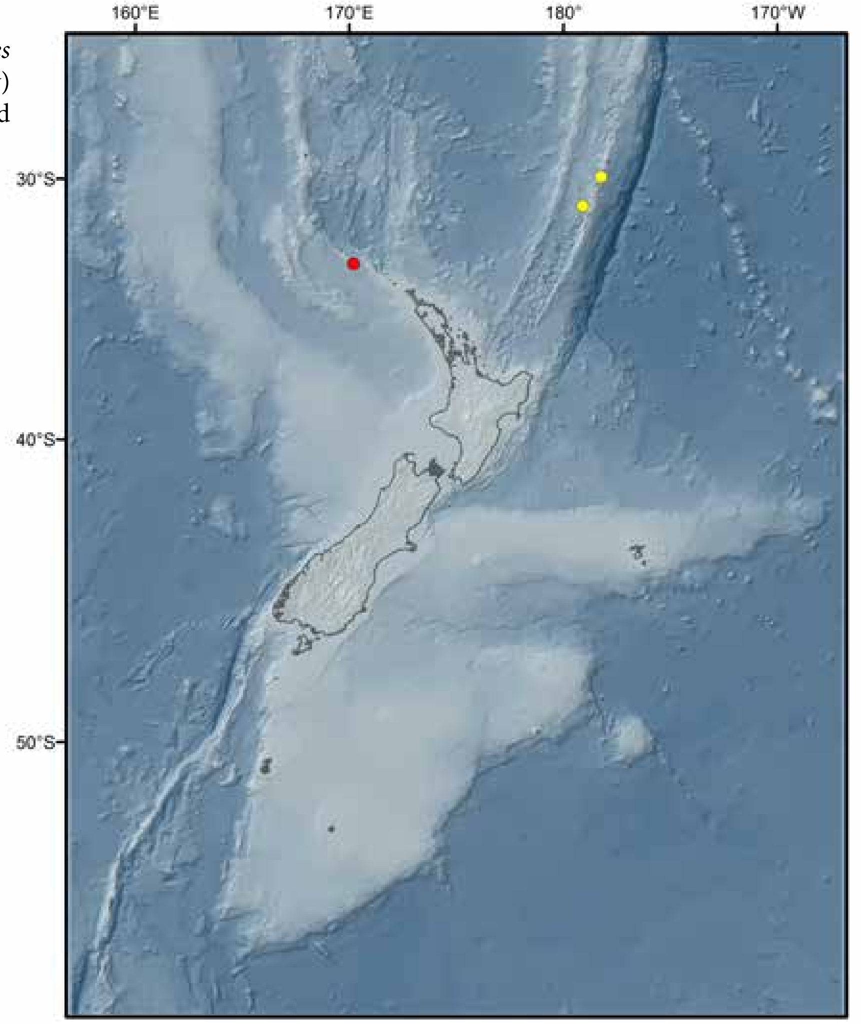


Figure 22. *Uroptychodes epigaster* Baba, 2004, male, pcl 4.7 mm, NIWA 42390: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left Mxp3; **H.** right cheliped, dorsal; **I.** right cheliped ischiomerus, mesial; **J–L.** left P2–4; **M.** distal portion of propodus and dactylus, P2; **N.** distal portion of propodus and dactylus, P4. Scale bars = 2 mm.

Figure 23. Distribution of *Uroptychodes spinimarginatus* (Henderson, 1885) (yellow) and *Ud. epigaster* Baba, 2004 (red) around New Zealand.



the presence of a pair of small spines in the hepatic region, the pterygostomian flap contains more than two spines directly under anterior linea anomurica, the P2 propodus extensor margin bears 2–4 small proximal spines; three of the five examined specimens also have an additional spine proximal to the distal pair of spines on the flexor margins of P3–4 propodi (Fig. 22K, L). Also, all the specimens have a fringe of slender spines or scales along the distal portion of P2 dactyli that is discernible under high magnification (Fig. 22M, N). The genus diagnosis indicates that the P2 dactylus is typically unarmed, but this fringe of fine scales is also present in *Ud. spinimarginatus* (see below) and has been added to the genus diagnosis. Most of these characters are not illustrated in the description of *Ud. epigaster* and not noted as variation but are constant in the material examined here. Direct comparison with the type material collected approx. 1000 km further north along the Norfolk Ridge, ideally, using DNA tools, will be required to determine whether this slight variation is sufficient to establish a new species for the material examined here.

One specimen each from both NIWA 42390 and NMNZ CR.021766 is infected with akentrogonid rhizocephalan parasites, identified as *Thylacoplethus novaezealandiae* Lützen, Glenner & Lörz, 2009 (see Fig. 21, left).

This species is only one of two species of *Uroptychodes* in New Zealand waters; differences between *Ud. epigaster* and *Ud. spinimarginatus* are discussed under the account of the latter species.

DNA sequence data. Interspecific sequence divergence for partial CO1 gene: 16.2% (*Ud. spinimarginatus*, NIWA 24582). Notably, the CO1 gene sequence aligns most closely with that of the congener *Ud. spinimarginatus* (Fig. 5) but the *Uroptychodes* clade is nested within *Uroptychus*, rendering it paraphyletic.

Uroptychodes spinimarginatus (Henderson, 1885)

Figs 23, 24

Diptychus spinimarginatus Henderson, 1885: 419.
Uroptychus spinimarginatus, Henderson 1888: 176, pl. 21, figs 2, 2a; Thomson 1899: 196 (list); Baba 1988: 46, figs 18, 19.
Uroptychodes spinimarginatus, Baba 2004: 112, figs 9b, c; Baba 2005: 27, 215 (synonymies, key; Baba *et al.* 2008: 26 (list and synonymies); Baba *et al.* 2009: 30, figs 24, 25; Schnabel 2009a: 546, figs 4, 5; Schnabel 2009b: 25 (list); Webber *et al.* 2010: 225 (list); Poore *et al.* 2011: 327, plate 5I; Yaldwyn & Webber 2011: 207 (list).

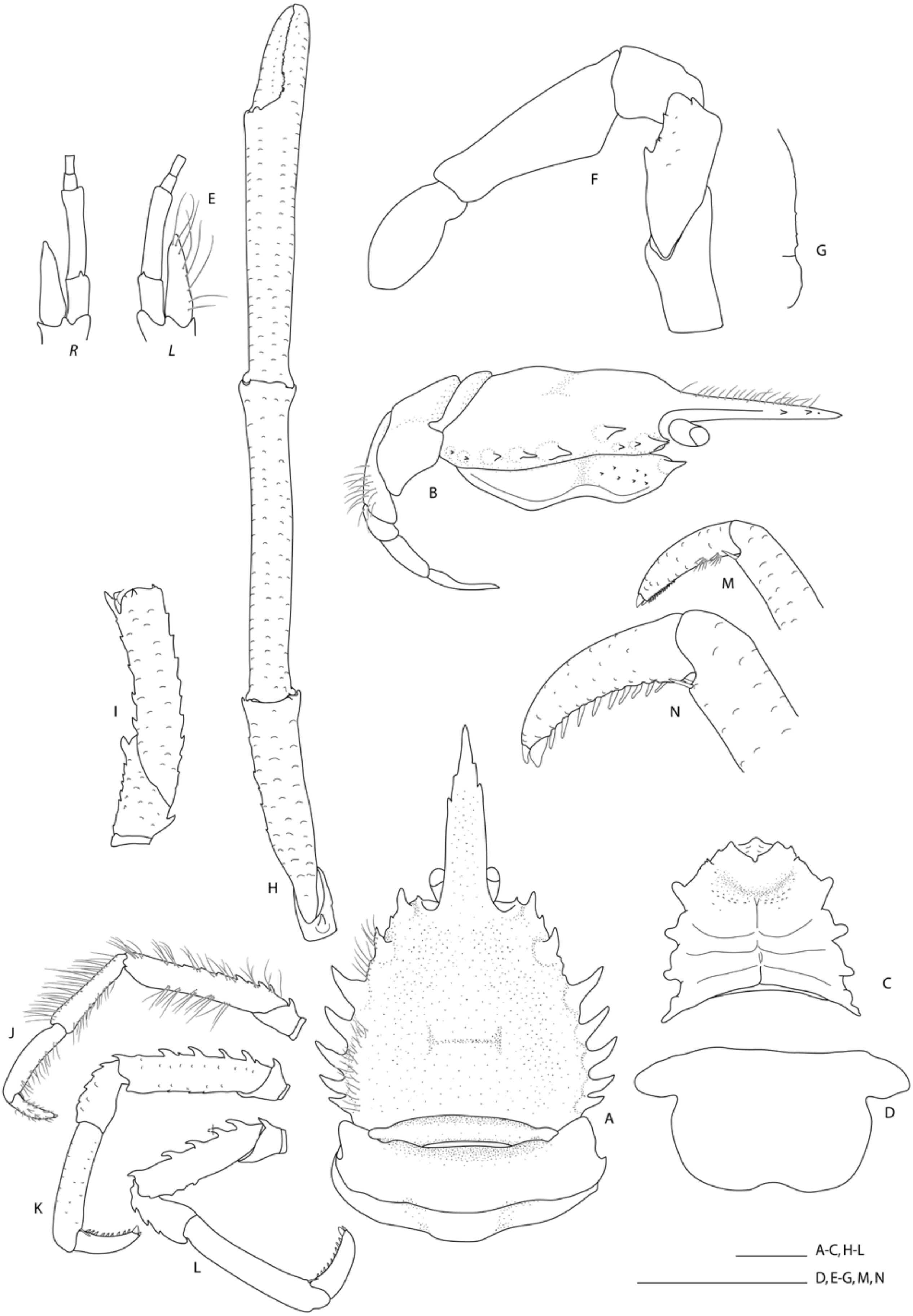


Figure 24. *Uroptychodes spinimarginatus* (Henderson, 1885), female, NIWA 24582: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left Mxp3; **H.** right cheliped, dorsal; **I.** right cheliped ischiomerus, mesial; **J.**–**L.** left P2–4; **M.** distal portion of propodus and dactylus, P2; **N.** distal portion of propodus and dactylus, P4. Scale bars = 2 mm.

Type & locality. Holotype—NHMUK 1888:33, H.M.S. *Challenger* Stn 170, Kermadec Islands, 29°55´S, 178°14´W, 952 m, 14 Jul 1874, female ov. lectotype (cl 10.3 mm).

Material examined. *Havre volcano*, *Kermadec Ridge*: NIWA 24582, NIRVANA Stn TAN1213/39, 31°6.25–6.11′S, 179°5.97′W, 1022–1034 m, 20 Oct 2012, 1 female (11.2 mm, pcl 6.0 mm; sequenced, see Fig. 5).

Distribution. Western Pacific: Kermadec Islands (Fig. 23), south of Mindanao (Philippines) (Henderson, 1885, 1888); Hunter and Matthew Islands, New Caledonia, and Kei Islands (Baba, 2004) and Manado Bight, Indonesia (Baba 2005), 458–1034 m.

Habitat. Specimens in the New Zealand region were only collected on deep-sea ridges. Baba (2004) lists two specimens associated with 'gorgonacean'.

Diagnosis. Carapace covered with fine setae, spineless on surface; lateral margin with 5 or 6 strong spines on branchial region, preceded by anterolateral spine of moderate size and 1 or 2 small spines on hepatic region. Rostrum with 2–5 small spines on distolateral margins. Abdomen unarmed. Sternite 3 with broad V-shaped excavation on anterior margin. Antennal peduncle having article 4 with small distoventral spine, article 5 unarmed, nearly twice as long as article 4; antennal scale reaching or slightly overreaching midlength of article 5. Mxp3 carpus unarmed; merus with 3 or 4 small spines in distal half of flexor margin, crista dentata with obsolescent denticles. Cheliped with setiferous scale-like ridges, some irregular lateral spines on merus. P3–4 meri and carpi dorsally with rows of spines, lateral surfaces unarmed; propodi unarmed except for distal pair of spines on flexor margins.

Colour in life. Baba *et al.* (2009) show the live coloration of a specimen collected in Taiwan. The anterior portion of the carapace, the cheliped, except for the fingers, and parts of the walking legs are deep pink, the gastric and cardiac regions are deep orange, and the other body parts are pale, transparent.

Remarks. Schnabel (2009a) examined all the type material of *Uroptychodes spinimarginatus* and reillustrated the paralectotype from the Kermadec Islands. The present specimen from the Havre volcano on the Kermadec Ridge is the first record from the region since the H.M.S. *Challenger* expedition in 1874 and approximately 150 km southwest of the type locality (Fig. 23). The single female can be clearly distinguished from other species of the genus by the combination of an unarmed dorsal carapace, with only the distal one-third of the lateral margin of rostrum with spines, antennal article 5 nearly twice as long as article 4 and the lateral branchial margin with five or six large spines, diminishing in size posteriorly in the posterior branchial region (Fig. 24).

The only other species of *Uroptychodes* in New Zealand waters, *Ud. epigaster*, can be distinguished from *Ud. spinimarginatus* by the presence of a pair of epigastric spines in *Ud. epigaster* (unarmed dorsal surface in *Ud. spinimarginatus*); the Mxp3 carpus has spines along the extensor margin in *Ud. epigaster* (unarmed in *Ud. spinimarginatus*), and the extensor margins of the P3–4 propodi are armed with spines in *Ud. epigaster* (unarmed in *Ud. spinimarginatus*).

DNA sequence data. The CO1 gene sequence for the new New Zealand specimen was compared with sequences for *Ud. spinimarginatus* collected in Indonesia in 2004 (KARUBAR expedition) and they are deeply divergent (15.3–15.7%) and most certainly belong to separate species (L. Corbari, pers. comm.). Baba (2004) noted some minor differences between the Indonesian material and the types and, considering the proximity of the New Zealand specimen to the type locality, it might be expected that the Indonesian specimens represent an undescribed species. Interspecific sequence divergence for partial CO1 gene: 16.2% (*Ud. epigaster*, NIWA 42390).

Genus ***Uroptychus*** Henderson, 1888

Diptychus A. Milne-Edwards, 1880: 61 (junior homonym of *Diptychus* Steindachner, 1866) (Pisces); A. Milne-Edwards & Bouvier 1897: 123.

Uroptychus Henderson, 1888: 173 (gender: feminine) (replacement name for *Diptychus* A. Milne-Edwards, 1880); Alcock 1901: 281; Stebbing 1910: 365; van Dam 1933: 18; Chace 1942: 9; Barnard 1950: 495; Zariquiey Álvarez 1968: 262; Baba 1988: 17; Ahyong & Poore 2004: 12; Poore 2004: 220; Baba 2005: 27; Baba *et al.* 2008: 27; Baba *et al.* 2009: 32; Macpherson & Baba 2011: 49; Baba 2018: 19.

Diagnosis. Carapace dorsally smooth, granulose, with scaly ridges or spines; lateral margin smooth or spinose, anterolateral spine distinct, rarely obsolete; posterior margin unarmed. Rostrum narrowly or broadly triangular, flattish, laterally smooth or with small spines. Lateral limit of orbit acuminate, rounded or with small spine. Pterygostomian flap proportionately high from anterior to posterior, rarely very low on posterior half. Excavated sternum anteriorly ending between bases of Mxp 1, with or without spine in centre or ridge in midline. Anterior margin of sternal plastron distinctly concave, with or without submedian spines and median notch or sinus; area between sternites 4–5 not constricted; sternite 4 posterolateral margin straight or convex (not concave). Antennal scale articulated with or fused to article 2, flagellum of no great length, directed anteriorly, never overreaching tip of cheliped. Cheliped spinose or unarmed, ischium with distodorsal spine. P2–4 dactyli with flexor marginal spines of various sizes and arrangements, P4 carpus subequal to, somewhat shorter than, or rarely longer than P3 carpus (modified from Baba 2018).

Remarks. *Uroptychus* is by far the largest genus in the family, with more than 250 described species, 100 of these recently described from the western Indo-West Pacific (Baba 2018). Many more undescribed species, however, await description in natural history collections around the world (K. Baba, pers. comm.).

The genus was first established as *Diptychus* A. Milne-Edwards, 1880 for five species: *D. nitidus*; *D. uncifer*; *D. armatus*; *D. rugosus*; *D. intermedius*. Despite considerable taxonomic attention to its replacement name, *Uroptychus* Henderson, 1888, and the erection of other genera for species once included, a type species has never been selected for *Diptychus*. As other genera are likely to be erected for other species groups within *Uroptychus*, *Diptychus nitidus* A. Milne-Edwards, 1880 is herein selected as the type species of *Diptychus*.

Type species. *Diptychus nitidus* A. Milne-Edwards, 1880.

(*continued on page 60*)

Key to species of *Uroptychus* from New Zealand

1. Rostrum very broad compared to length (about as wide as long), basal breadth at least two-thirds carapace breadth as measured between anterolateral spines **2**
– Rostrum narrow triangular (typically longer than wide), basal breadth usually half or less than half, rarely slightly more than half carapace breadth measured between the anterolateral spines **3**
2. Anterior margin of thoracic sternite 3 with pair of submedian spines. Cheliped merus without distinct proximal constriction .... ***U. alcocki*** Ahyong & Poore, 2004
– Anterior margin of sternite 3 without pair of submedian spines. Cheliped merus distinctly constricted proximally .... ***U. yokoyai*** Ahyong & Poore, 2004
3. Ocular peduncle extremely long, 3 × longer than broad **4**
– Ocular peduncle relatively short, at most 2 × longer than broad **5**
4. Carapace dorsum shallowly convex. Mxp3 merus with distinct tubercles along flexor margin .... ***U. novaezealandiae*** Borradaile, 1916
– Carapace strongly convex from side-to-side. Mxp3 merus smooth along flexor margin .... ***U. rungapapa* sp. nov.**
5. P2–4 dactyli with 2 terminal (ultimate and penultimate) spines only .... ***U. inaequalis*** Baba, 2018
– P2–4 dactyli with flexor marginal spines (arranged in regular row or separated into a distal and proximal groups) **6**
6. Carapace with distinct spines on dorsal surface of cardiac and/or branchial region **7**
– Carapace without spines on dorsal surface of cardiac and branchial regions (surface can be tuberculate) **13**
7. Abdomen armed **8**
– Abdomen unarmed **10**
8. Antennal article 3 unarmed. Surface of thoracic sternite 4 not bearing distinct spines (transverse row of tubercles may be present). Abdominal tergites 4–6 unarmed .... ***U. sadie* sp. nov.**
– Antennal article 3 bearing spine. Surface of sternite 4 with distinct spines. All abdominal tergites spinose **9**
9. Rostrum distally broad (not tapering), bearing numerous (8 or 9) lateral spines. Surface of thoracic sternite 3 with at least pair of small spines and sternite 4 with numerous distinct spines .... ***U. numerosus*** Baba, 2018
– Rostrum distally narrowing, with two pairs of lateral spines. Surface of thoracic sternite 3 smooth and sternite 4 with pair of distinct submedian spines .... ***U. spinirostris*** (Ahyong & Poore, 2004)
10. P2–4 dactyli with penultimate spine subequal to antepenultimate **11**
– P2–4 dactyli with penultimate spine prominent, > 2 × length of antepenultimate **12**
11. Cheliped palm and P2–4 meri and carpi distinctly spinose; propodi with row of movable spines on flexor margin .... ***U. taratara* sp. nov.**
– Cheliped palm unarmed and P2–4 meri and carpi unarmed; propodi with distal pair of spines on flexor margin only .... ***U. taniwha* sp. nov.**

Key to species of *Uroptychus* (*continued*)

12. Carapace surface with row of epigastric, paired cardiac, and posterior branchial spines only; posteriormost of carapace lateral spines largest. P2–4 propodi with distal pair of spines only .... ***U. paku*** Schnabel, 2009

– Entire carapace surface scattered with small spines; posteriormost of carapace lateral spines distinctly smaller than preceding spine. P2–4 propodi with a row of spines along flexor margin .... ***U. tracey*** Ahyong, Schnabel & Baba, 2015

13. P2 dactylus with flexor marginal spines separated into proximal group of spines separated from distal pair by considerable distance (at least on P2) **14**

– P2 dactylus with flexor marginal spines equidistant from one another or somewhat broadly interspersed distally, not remotely separated into proximal and distal group **16**

14. Pair of epigastric spines present .... ***U. havre*** **sp. nov.**

– Pair of epigastric spines absent **15**

15. P2–4 propodi with concave prehensile edge (distal part of flexor margin); distalmost of flexor marginal spines located near juncture with dactylus; dactylar spination similar on P2–4 .... ***U. thermalis*** Baba & de Saint Laurent, 1992

– P2–4 propodi with straight prehensile edge (distal part of flexor margin); distalmost of flexor marginal spines located remote from juncture with dactylus; dactylar spination different on P2–4 .... ***U. remotispinatus*** Baba & Tirmizi, 1979

16. P2–4 dactyli with spines oriented parallel to flexor margin **17**

– P2–4 dactyli with spines oriented obliquely or perpendicularly **21**

17. P2–4 propodi with distalmost of flexor marginal spines remote from juncture with dactyli; two spines situated at mid-length of flexor margin .... ***U. bispinatus*** Baba, 1988

– P2–4 propodi with distalmost of flexor marginal spines close to juncture with dactyli; row of spines along distal portion of flexor margin **18**

18. Distalmost of flexor marginal spines of P2–4 propodi single, not paired .... ***U. brevisquamatus*** Baba, 1988

– Distalmost of flexor marginal spines of P2–4 propodi paired **19**

19. P4 merus length about 0.5 × P2 merus length. Ocular peduncle with straight mesial margin .... ***U. australis*** (Henderson, 1885)

– P4 merus length about 0.7 × P2 merus length. Ocular peduncle with concave mesial margin **20**

20. Carapace branchial margins subparallel. Cheliped merus with ventral row of spines. .... ***U. webberi*** Schnabel, 2009

– Carapace lateral margin convexly divergent and widening posteriorly. Cheliped merus with ventral surface granular but without spines .... ***U. disangulatus*** Baba, 2018

21. P2–4 dactyli with penultimate spine much broader than (usually >2 ×) antepenultimate **22**

– P2–4 dactyli with penultimate spine subequal to or somewhat broader than antepenultimate **41**

22. Anterolateral spine of carapace smaller than or subequal to lateral orbital spine **23**

– Anterolateral spine of carapace distinctly larger than lateral orbital spine **25**

23. Carapace and abdominal somite 2 covered with denticle-like small spines. P2–4 meri with dorsal spines .... ***U. kaitara*** Schnabel, 2009

– Anterior carapace with denticle-like small spines, remainder of carapace and abdomen smooth. P2–4 meri unarmed **24**

24. Carapace deeply sculptured; prominent, paired hepatic and epigastric ridges of denticles; deep cervical groove .... ***U. helenae*** **sp. nov.**

– Carapace not deeply sculptured; anterior branchial region with small denticulate process, otherwise not elevated; cervical groove not deep .... ***U. toka*** Schnabel, 2009

25. P2–4 dactyli with flexor marginal spines directed perpendicularly along flexor margin .... ***U. yaldwyni*** Schnabel, 2009

– P2–4 dactyli with flexor marginal spines obliquely directed **26**

Key to species of *Uroptychus* (*continued*)

26. Carapace lateral margin with anterolateral spine only, no additional spine (acute tubercles and an irregular margin may be present). P2–4 dactyli with at most six spines .... ***U. tomentosus*** Baba, 1974

– Carapace lateral margin with distinct spine(s) in addition to anterolateral spine. P2–4 dactyli with >6 spines **27**

27. Carapace lateral margin with one prominent spine situated at midlength .... ***U. raymondi*** Baba, 2000

– Carapace lateral margin with more than one spine in addition to anterolateral spine **28**

28. Ocular peduncle with dorsodistal field of granules just behind the cornea. Rostrum distally broad, trifid. Carapace with dorsoventrally flattened process along lateral margin .... ***U. pars*** **sp. nov.**

– Ocular peduncle entirely smooth. Rostrum triangular, distally narrowed. Carapace lateral margin evenly convex (without dorsoventrally flattened process) **29**

29. Carapace very wide (0.6–0.7 × as long as wide). Sternite 3 with ill-defined median notch on anterior margin .... ***U. vulcanus*** Baba, 2018

– Carapace about as long as broad. Sternite 3 with median notch separating distinct or obsolescent submedian spines on anterior margin **30**

30. P2 carpus with more than one spine on extensor margin **31**

– P2 carpus unarmed or with at most one distal spine on extensor margin **33**

31. Rostrum laterally serrated. Abdominal somite 1 with sharp transverse ridge. P2–4 propodi with smooth extensor margin .... ***U. longior*** Baba, 2018

– Rostrum laterally smooth except for pair of subapical spines. Abdominal somite 1 without sharp transverse ridge. P2–4 propodi with spines at least at proximal portion of extensor margin **32**

32. Lateral carapace margin with row of four prominent posterior branchial spines. Cheliped carpus shorter than palm (0.8–0.9 ×), rugose on surface. P2–4 propodi usually with two proximal spines on extensor margin .... ***U. taranui*** **sp. nov.**

– Lateral carapace margin with at most one prominent posterior branchial spine, margin otherwise serrated. Cheliped carpus longer than palm (1.1–1.2 ×), spinose on surface. P2–4 propodi usually with row of spines along most of extensor margin .... ***U. chathami*** **sp. nov.**

33. Sternite 4 with posterolateral margin as long as or longer than anterolateral margin .. ***U. depressus*** Baba, 2018

– Sternite 4 with posterolateral margin shorter than anterolateral margin **34**

34. P2–4 propodi with distal pair of spines only **35**

– P2–4 propodi with row of spines in addition to distal pair **39**

35. P2–4 dactyli subequal in length **36**

– P4 dactyli noticeably longer than P2 dactyli (and bearing more spines) **38**

36. Antennal articles 4 and 5 with small distal spine. Antennal scale barely reaching end of peduncle. Thoracic sternites 3 and 4 anterolaterally rounded .... ***U. belos*** Ahyong & Poore, 2004

– Antennal articles 4 and 5 with very long distal spine. Antennal scale clearly overreaching peduncle. Thoracic sternites 3 and 4 anterolaterally serrate and/or acute **37**

37. Carapace dorsal surface and pterygostomian flap smooth; lateral margins with 3 spines in addition to antero-lateral spine. Ultimate spine on P2–4 dactyli much broader than antepenultimate spine .... ***U. leptus*** **sp. nov.**

– Carapace dorsal surface with scattered hepatic and parahepatic spines; pterygostomian flap with a median row of anterior spines; lateral carapace margin with 5 or 6 branchial spines. Ultimate spine on P2–4 dactyli subequal or smaller than antepenultimate spine .... ***U. bathamae*** **sp. nov.**

38. Carapace lateral margin with distinct branchial spines. Antennal article 2 with distinct lateral spines. P2–4 meri dorsally serrate .... ***U. tasmani*** **sp. nov.**

– Carapace lateral margin with indistinct branchial spines (small spines or serrations instead). Antennal article 2 with lateral spine indistinct. P2–4 meri dorsally smooth .... ***U. belli*** **sp. nov.**

39. Field of more than 10 spines across epigastric region. Cheliped merus with scattered spines across surface .... ***U. cardus*** Ahyong & Poore, 2004

– No distinct spine in epigastric region. Cheliped merus unarmed (distal margins may bear spines) **40**

Key to species of *Uroptychus* (*continued*)

40. Lateral carapace margin distinctly convex; dorsal surface setose, with a few hepatic spines. Rostrum with distinct subapical spines .... ***U. taranaki* sp. nov.**

– Lateral carapace margins nearly sub-parallel; dorsal surface smooth. Rostrum at most serrated (distinct subapical spines absent) .... ***U. koningen* sp. nov.**

41. P2–4 dactyli with ultimate spine more slender than penultimate **42**

– P2–4 dactyli with ultimate spine subequal to or larger than penultimate **54**

42. P2–4 propodi without flexor marginal spines .... ***U. anomalus* sp. nov.**

– P2–4 propodi at least with distal flexor marginal spine(s) **43**

43. P2–4 propodi with distal spine(s) only on flexor margin (at least on P4; P2 and P3 may have an additional spine) **44**

– P2–4 propodi with row of spines along flexor margin **51**

44. Lateral carapace margin with distinct spines; anterolateral spine pronounced, straight, directed anteriorly in dorsal view **45**

– Lateral carapace margin smooth or slightly irregular, without distinct spines; anterolateral spine small or absent, not directed straight anteriorly **48**

45. Carapace wider than long; lateral spines irregularly arranged; anterior branchial spine most prominent, row of small posterior branchial spines remotely situated .... ***U. defayeae*** Baba, 2018

– Carapace as long as or longer than wide; lateral margin with row of regularly arranged spines **46**

46. Rostrum lateral margin smooth. Antennal scale not reaching beyond midlength of antennal article 5. Anterior margin of thoracic sternite 3 anterolaterally rounded .... ***U. ahyongi* sp. nov.**

– Rostrum lateral margin with distinct subapical spines. Antennal scale overreaching antennal article 5. Anterior margin of thoracic sternite 3 anterolaterally acute **47**

47. Carapace lateral margin with 12–18 small spines behind anterolateral spine. P2–4 meri with distinct dorsal spines .... ***U. spinosior*** Baba, 2018

– Carapace lateral margin with 5–7 spines behind anterolateral spine. P2–4 meri dorsally serrated but without distinct spines .... ***U. annae*** Baba, 2018

48. Anterior margin of thoracic sternite 3 deeply V-shaped, without distinct median notch. P2–4 propodi with single distal spine or unarmed **49**

– Anterior margin of thoracic sternite 3 with distinct median notch, flanked by distinct or obsolescent submedian spines. P2–4 propodi with pair of terminal spines **50**

49. Carapace with rounded anterolateral corner, anterolateral spines absent. P4 merus longer than P3 merus; flexor marginal spines on P2–4 dactyli arranged perpendicularly .... ***U. cylindropus*** Baba, 2018

– Carapace with small but distinct anterolateral spines (directed mesially). P4 merus shortest; flexor marginal spines on P2–4 dactyli directed proximally .... ***U. ihu* sp. nov.**

50. Carapace gastric region smooth, not inflated. Pterygostomian flap smooth. Rostrum clearly overreaching ocular peduncle. Antennal article 2 laterally unarmed .... ***U. enriquei*** Baba, 2018

– Carapace gastric region with two broad prominences. Pterygostomian flap distinctly granular. Rostrum barely overreaching ocular peduncle. Antennal article 2 with distinct lateral spine .... ***U. rutua*** Schnabel, 2009

51. Sternite 3 slightly depressed in ventral view (demarcation between sternite 3 and 4 indistinct), anterior margin with minute notch or submedian spines if present **52**

– Sternite 3 distinctly depressed in ventral view (demarcation between sternite 3 and 4 distinct), anterior margin at least with distinct median notch, with or without distinct submedian spines **53**

52. Lateral carapace margin with row of 6–8 branchial spines. Antennal articles 4 and 5 unarmed. Cheliped carpus unarmed. P2–4 propodi flexor margin distinctly convex .... ***U. duplex*** Baba, 2018

– Lateral carapace margin with row of 4 or 5 small branchial spines. Antennal articles 4 and 5 each with small distal spines. Cheliped carpus with dorsal row of spines. P2–4 propodi flexor margin straight. .... ***U. palmaris*** Baba, 2018

Key to species of *Uroptychus* (*continued*)

53. Lateral carapace margin with small spines only. Antennal articles 4 and 5 each with distal spine; antennal scale overreaching peduncle by full length of article 5. P2–4 dactyli with 5 or 6 oblique spines ....***U. multispinosus*** Ahyong & Poore, 2004

– Lateral carapace margin with 4 large spines on branchial region. Only antennal article 4 with distal spine; antennal scale only slightly overreaching peduncle. P2–4 dactyli with 8–11 nearly perpendicular spines .... ***U. baeomma*** Baba, 2018

54. P2–4 propodi unarmed on flexor margin ....***U. longvae*** Ahyong & Poore, 2004

– P2–4 propodi with terminal spine(s) and/or row of spines on flexor margin **55**

55. Anterior margin of thoracic sternite 3 without distinct median notch and submedian spines (ill-defined median notch may be present) **56**

– Anterior margin of thoracic sternite 3 with pair of median spines or well-defined median notch separating distinct or obsolescent spines **62**

56. Carapace lateral margin with distinct spines other than anterolateral spines **57**

– Carapace lateral margin unarmed other than anterolateral spine (fine serration may be present) **60**

57. Lateral carapace with small spine at anterior branchial margin; posterior branchial margin irregular or serrated. Antennal articles 4 and 5 unarmed ....***U. proberti* sp. nov.**

– Distinct row of multiple spines along lateral branchial margin. Antennal articles 4 and 5 with distal spine on each **58**

58. Carapace with distinct epigastric spines. Antennal scale falling short of end of peduncle ....***U. macquariae*** Schnabel, Burghardt & Ahyong, 2017

– Carapace epigastric region unarmed, at most with some obsolescent tubercles. Antennal scale at least reaching end of peduncle **59**

59. Carapace entirely unarmed. P2–4 propodi of at least P2 distally inflated; dactyli with 6–8 strong spines along flexor margin ....***U. megistos*** Baba, 2018

– Carapace with small paired spines mesial to first anterior branchial spines. P2–4 propodi with lateral margins parallel (not inflated); dactyli with 10–11 strong spines along flexor margin ....***U. ritchie* sp. nov.**

60. Cheliped long, 4–5 × pcl. P2–4 propodi distally inflated on flexor margin **................** ***U. plumella*** Baba, 2018

– Cheliped relatively short, 3–4 × pcl. P2–4 propodi with extensor and flexor margins parallel (flexor margin not inflated) **61**

61. Carapace wider than long (without rostrum). Antennal article 2 distolaterally unarmed; antennal scale barely reaching apex of antennal peduncle. Mxp3 at most with small spines on merus, carpus unarmed ....***U. laperousazi*** Ahyong & Poore, 2004

– Carapace longer than wide (without rostrum). Antennal article 2 with distolateral spine; antennal scale clearly overreaches the peduncle. Mxp3 with strong spines on merus and distal spine on carpus ***U. torrancei* sp. nov.**

62. P2–4 propodi with row of flexor marginal spines distally ending in single spine **63**

– P2–4 propodi with row of flexor marginal spines distally ending in pair of spines **64**

63. Cheliped ischium distoventrally smooth, unarmed. P2–4 relatively slender: P2 merus typically > 4.5 × longer than broad, slightly longer than P3 merus (1.1–1.3 ×). Flexor margins of P2–4 propodi having distalmost spine remote from juncture with dactylus (closer to distal second spine or equidistant between juncture and distal second spine) ....***U. nigricapillis*** Alcock, 1901

– Cheliped ischium distoventral spine small to vestigial. P2–4 relatively broad: P2 merus < 4.5 × longer than broad, subequal in length to P3 merus (0.9–1.1 ×). Flexor margin of P2–4 propodi having distalmost spine close to juncture with dactylus ....***U. terminalis*** Baba, 2018

64. Sternite 5 with feebly convex or nearly straight anterolateral margin ....***U. politus*** (Henderson, 1885)

– Sternite 5 with distinctly convex anterolateral margin **65**

65. Carapace lateral margin with well-developed spine at anterior branchial margin ....***U. nieli* sp. nov.**

– Carapace lateral margin with anterolateral spine only, unarmed elsewhere (margin may be irregular) **66**

Key to species of *Uroptychus* (*continued*)

66. Carapace anterior cardiac region with distinct paired depressions. Pereopods elongate: P2 merus as long as pcl; P2–4 carpi nearly as long as propodi ....***U. bicavus*** Baba & de Saint Laurent, 1992

– Carapace anterior cardiac region without distinct paired depressions. Pereopods stout: P2 merus distinctly shorter than pcl; P2–4 carpi distinctly shorter than propodi (< two-thirds length) **67**

67. Cheliped ischium with distinct subterminal ventromesial spine and large curved distodorsal spine .... ***U. maori*** Borradaile, 1916

– Cheliped ischium unarmed or with obsolescent or small subterminal spine on ventromesial margin and distodorsal spine distinct but not extremely long and curved **68**

68. Dorsal carapace surface granulose. Antennal articles 4 and 5 each with small distal spine. P2–4 dactylus long (1.5 × length of carpus, two-thirds length of propodus) .... ***U. nirvana* sp. nov.**

– Dorsal carapace surface smooth. Antennal articles 4 and 5 unarmed. P2–4 dactylus short (shorter than carpus, < 0.5 × propodus) **69**

69. Pterygostomian flap anteriorly rounded or bluntly angular, with or without tiny spine at anterior terminus ... .***U. empheres*** Ahyong & Poore, 2004

– Pterygostomian flap anteriorly produced to distinct spine **70**

70. Antennal article 2 distolaterally angular, lacking distinct spine. Thoracic sternite 4 with anterolateral margin rounded anteriorly, without distinct spine(s) .... ***U. inermis*** Baba, 2018

– Antennal article 2 with well-developed distolateral spine. Thoracic sternite 4 with anterolateral margin bearing distinct anterior spine(s) **71**

71. Posterolateral corner of carapace ridged (at least in large specimens). Antennal article 5 about 2 × length of article 4. Cheliped 3.8–4.8 × length of pcl; palm length 2 × width in adults .... ***U. litosus*** Ahyong & Poore, 2004

– Posterolateral corner of carapace lacking distinct ridge. Antennal article 5 about 3 × length of article 4. Cheliped typically 5–6 × length of pcl; palm length 2.5–3 × width ....***U. aotearoa* sp. nov.**

(*continued from page 55*)

***Uroptychus ahyongi* sp. nov.** Figs 25–27

Material examined. Holotype NIWA 106419, NIWA Stn KAH9801/6, Z8990, 37°31.70′S, 176°46.96′E, Bay of Plenty, 570 m, 18 Jan 1998, female (12.4 mm, pcl 8.0 mm). **Paratypes** *Bay of Plenty*: NIWA 23335, 2 females ov. (11.6, 10.2 mm, pcl 7.2, 6.4 mm), 2 males (9.5, 8.3 mm, pcl 6.0, 5.2 mm); NMNZ CR.025203, off Mayor Island, 37°6.0–10.2′S, 176°15.4–17.8′E, 410–415 m, 21 Jun 1987, FV *Trinity*, col. R. McGrath, 1 male (11.8 mm, pcl 7.2 mm). *Chatham Rise*: NIWA 76362, NIWA Stn TAN1008/37, 43°25.01–25.37′S, 179°58.98–58.99′E, 401–407 m, 10 Jun 2010, 8 females ov. (10.6, 9.1, 8.6, 7.7, 7.5, 5.3, 4.5 mm, broken rostrum, pcl 6.6, 5.6, 5.2, 4.9, 4.6, 3.3, 2.9, 5.9 mm; 5.6 mm female ov. sequenced, see Fig. 5), 3 females (5.5, 4.8, 4.6 mm, pcl 3.4, 2.9, 2.9 mm), 4 males (7.6, 7.1, 5.8, 5.1 mm, pcl 5.4, 4.4, 3.5, 3.1 mm).

Other material. *Northland Plateau*: NIWA 23340, NZOI Stn I45, 35°00.10′S, 174°59.89′E, 596 m, 08 May 1975, 1 female ov. (9.9 mm, 6.2 mm); NIWA 23339, NZOI Stn I36, 35°0.20′S, 174°49.20′E, 625 m, 7 May 1975, 1 female ov. (8.1 mm, pcl 5.1 mm), 1 male (7.2 mm, pcl 4.5 mm); NIWA 23357, NZOI Stn I37, 35°06.00′S, 174°40.10′E, 560 m, 08 May 1975, 1 female (7.5 mm, pcl 4.8 mm), 1 male (9.0 mm, 5.6 mm).

Bay of Plenty: NIWA 23349, NIWA Stn KAH9801/37, 36°40.90′S, 176°14.78′E, 465 m, 24 Jan 1998, 1 female ov. (9.0 mm, pcl 5.6 mm); NIWA 23350, NIWA Stn KAH9801/37, 36°40.90′S, 176°14.78′E, 465 m, 24 Jan 1998, 1 female ov. (11.0 mm, pcl 7.0 mm), 1 female (9.5 mm, pcl 6.0 mm); NIWA 23347, NIWA Stn KAH9801/39, 36°57.75′S, 176°19.32′E, 535 m, 25 Jan 1998, 1 male (11.8 mm, pcl 7.5 mm); NIWA 23345, NIWA Stn KAH9801/27, 37°05.60′S, 176°15.20′E, 393 m, 22 Jan 1998, 2 females ov. (11.5, 8.0 mm, pcl 7.5, 5.1 mm), 1 male (9.0 mm, pcl 5.5 mm); NIWA 23343, NIWA Stn KAH9801/23, 37°08.61′S, 176°19.64′E, 472 m, 21 Jan 1998, 1 female ov. (10.7 mm, pcl 6.8 mm), 2 females (7.9, 7.2 mm, pcl 4.9, 4.6 mm); NIWA 23333, NIWA Stn KAH9801/23, Z9007, 37°08.61′S, 176°19.64′E, 472 m, 21 Jan 1998, 57 specimens, not measured; AM P.102314 (ex NIWA 23333), NIWA Stn KAH9801/23, Z9007, 37°08.61′S, 176°19.64′E, 472 m, 21 Jan 1998, 4 females ov. (11.8, 11.6, 9.1, 7.9 mm, pcl 7.3, 7.4, 5.7, 5.0 mm), 2 females (10.9, 10.9 mm, pcl 7.1, 6.6 mm), 4 males (rostrum truncated, 10.5, 9.6, 6.6 mm, pcl 7.1, 6.5, 5.6, 4.3 mm); NIWA 23337, NIWA Stn KAH9801/24, Z9008, 37°09.87′S, 176°21.74′E, 518 m, 22 Jan 1998, 5 females ov. (11.3, 10.6, 9.7, 9.3, 9.2 mm, pcl 7.2, 6.6, 6.1, 5.9, 5.7 mm), 6 females (10.8, 10.0, 9.3, 9.0, 8.3, 7.6 mm, pcl 6.9, 6.5, 6.0, 5.9, 5.1, 4.8 mm), 6 males (10.5, 10.5, 10.2, 9.7, mm, 2 with broken rostrum, pcl 7.0, 6.4, 6.1, 6.0, 6.2, 6.0 mm); NIWA 23344, NIWA Stn KAH9801/10, 37°20.19′S, 176°22.40′E, 297 m, 19 Jan 1998, 1 female (9.2 mm, pcl 6.0 mm); NIWA 23334, NIWA Stn KAH9801/12, 37°23.23′S, 176°32.85′E, 525 m, 19 Jan 1998, 29 specimens (not measured); NIWA 23336, NIWA Stn KAH9801/13, Z8997, 37°25.20′S, 176°36.49′E, 537 m, 19 Jan 1998, 6 females ov. (11.0, 10.4, 9.7, 9.5, 8.8, 7.7 mm, pcl 7.0, 6.7, 6.0, 6.0, 5.6, 5.0 mm), 12 females (9.9, 9.9, 8.6, 8.4, 8.4, 8.2, 8.0, 6.8, 7.2, 7.2, 6.6, 6.5 mm, pcl 6.3, 6.2, 5.6, 5.5, 5.2, 5.3, 4.8, 4.3, 4.6, 4.6, 5.8, 4.3 mm), 16 males (10.9, 9.7, 9.6, 9.4, 9.4, 8.7, 8.6, 8.5, 8.5, 8.4, 8.2, 8.1, 8.0, 7.7, 7.7, 6.8 mm, pcl 6.8, 6.0, 6.0, 5.9, 5.9, 5.5, 5.5, 5.5, 5.4, 5.0, 5.2, 4.9, 5.0, 5.0, 4.9, 4.2 mm); NIWA 23351, NIWA Stn KAH9801/4, 37°27.76′S, 176°39.66′E, 523 m, 17 Jan 1998, 2 females ov. (9.4, 8.9 mm, pcl 6.1, 5.8 mm), 2 males (8.5, 7.3 mm, pcl 5.2, 4.6 mm); NIWA 23353, NIWA Stn KAH9801/4, 37°27.76′S, 176°39.66′E, 523 m, 17 Jan 1998, 2 females ov. (10.3 mm, pcl 6.6 mm), 1 male (8.3 mm, pcl 5.3 mm); NIWA 23338, KAH0001/74, 37°27.79′S, 176°38.17′E, 496–492.0, 20/02/2000, 2 females ov. (8.2 mm, rostrum broken, pcl 6.4, 5.0 mm), 3 females (10.6, 8.1, 7.1 mm, pcl 6.9, 5.1, 4.6 mm), 2 males (9.7, 7.2 mm, pcl 6.3, 4.5 mm); NIWA 23346, NIWA Stn KAH9801/2, 37°28.23′S, 176°34.40′E, 330 m, 17 Jan 1998, 1 female (7.8 mm, pcl 4.9 mm); NIWA 23352, NIWA Stn KAH9801/2, 37°28.23′S, 176°34.40′E, 330 m, 17 Jan 1998, 1 female (5.3 mm, pcl 3.3 mm), 1 male (8.0 mm, pcl 5.0 mm); NIWA 23356, NIWA Stn KAH9801/3, 37°29.68′S, 176°40.35′E, 460 m, 17 Jan 1998, 1 female (9.0 mm, pcl 5.8 mm), 1 male (7.4 mm, pcl 4.6 mm); NIWA 23354, NIWA Stn KAH9801/3, 37°29.68′S, 176°40.35′E, 460 m, 17 Jan 1998, 1 female ov. (8.2 mm, pcl 5.2 mm), 1 female (9.7 mm, pcl 6.2 mm); NIWA 23348, NIWA Stn KAH9801/20, 37°33.13′S, 176°56.10′E, 446 m, 21 Jan 1981, 1 female ov. (7.6 mm, pcl 4.8 mm), 1 female (11.5 mm, pcl 7.2 mm); NIWA 23342, NIWA Stn KAH9801/15, 37°36.80′S, 177°12.70′E, 460 m, 20 Jan 1998, 1 male (9.8 mm, pcl 6.3 mm); NMNZ CR.015258, CR.023730, CR.23731, CR.23732, Northern Prawn Cruise Stn T9, 36°59.14′S, 175°59.31′E, 380–399 m, 1 Jan 1969, 3 females (11.6, 10.4, 10.1 mm, pcl 7.5, 6.5, 6.3 mm), 1 male (11.4 mm, pcl 7.1 mm); NMNZ CR.25208, Northern Prawn Cruise 1968/69 Stn T25, 37°04.04′S, 176°17.70′E, Alderman Islands, 439 m, 8 Jan 1969, 1 male (rostrum broken, pcl 6.6 mm); NMNZ CR.25204, VUW Marine Department FRD 62/10, 37°11.79′S, 176°15.48′E, off Mayor Island, 366 m, 28 Sep 1962, 5 females (9.6, 9.0, 8.7, 7.7, 7.1 mm, pcl 6.0, 6.0, 5.2, 4.9, 4.5 mm); NMNZ CR.023766, MV *Alert*, BS 209, 37°20.5′S, 176°26.5′E, off Mayor Island, 494 m, 27 Feb 1957, col. R.B. Pike, 2 female ov. (8.6, 8.0 mm, pcl 5.5, 4.8 mm), 3 females (8.1, 7.2, 7.1, pcl 5.0, 4.5, 4.5 mm), 1 male (10.5 mm, 6.5 mm); NMNZ CR.16815, Stn Marine Department FRD 62/11, 37°26′S, 176°30′E, off Motiti Island, 530 m, 29 Sep 1962, 1 female (10.5 mm, pcl 6.5 mm), 1 male (9.6 mm, pcl 5.9 mm and 72 specimens, not measured); NMNZ CR.023769, CR.23770, CR.23773, VUW Marine Department FRD 62/11, 37°26′S, 176°30′E, off Motiti Island, 530 m, 29 Sep 1962, 6 males (10.5, 10.4, 9.9, 9.9, 8.5, 8.0 mm, pcl 6.5, 6.4, 6.3, 6.1, 5.2, 5.0 mm); NMNZ CR.023796, 37°26.38′S, 176°24.34′E, off Mayor Island, 329–402 m, 4 Aug 1963, 1 female ov. (10.6 mm, pcl 6.5 mm); NMNZ CR.025199, CR.25200, CR.25201, Stn No 62/13, 37°31.26′S, 177°22.37′E, off White Island, 400–328 m, 30 Sep 1962, col. R.B. Pike, 3 females (10.6, 3.9, 3.7 mm, pcl 6.8, 2.3, 2.3 mm); NMNZ CR.025207, NZOI Stn J704, 37°31.5′S, 176°59.4′E, 413 m, 11 Sep 1974, 1 female (7.0 mm, pcl 4.3 mm), 1 male (6.4 mm, pcl 4.0 mm); NMNZ CR.025206, NZOI Stn F885, 37°34.2′S, 176°43.8′E, 499 m, 04 Oct 1968, 1 female (3.9 mm, pcl 2.4 mm); NMNZ CR.015261, CR.23793, CR.23794, CR.23795, Bay of Plenty, no further locality information, 457 m (250 fms), 13 Jun 1962, col. J. Costello, 1 female ov. (11.5 mm, pcl 7.3 mm), 2 females (11.1, 10.6 mm, pcl 7.1, 6.7 mm), 1 male (10.0 mm, 6.1 mm); AKM MA3156, AKM Stn 9/8/6, 37°27′S, 176°26′E, 11 miles off Motiti Island, 357–366 m, 8 Jun 1979, 2 males (9.6, 6.4 mm, pcl 5.9, 3.9 mm); AKM MA120895, AKM Stn K415/71, 37°30′S, 176°15′E, Aldermen Islands, 348–366 m, 30 Nov 1971, 1 female (12.3 mm, pcl 7.6 mm); AKM MA101547, 37°36′S, 76°50′E, 16 miles (26 km) west of White Island, 457–622 m, 7 Jun 1979, 1 female (8.4 mm, pcl 5.3 mm).

Hikurangi Margin: NIWA 85532, NIWA Stn KAH1205/132, 40°01.32–04.34′S, 177°17.81–17.73′E, 473–467 m, 12 Apr 2012, 1 female (5.9 mm, pcl 3.6 mm; sequenced, see Fig. 5); NMNZ CR.025205, NZOI Stn E705, 40°07.8′S, 177°10.2′E, 497 m, 21 Mar 1967, 1 female (7.3 mm, pcl 4.5 mm).

Chatham Rise: NIWA 44887, NIWA TAN0801/16,

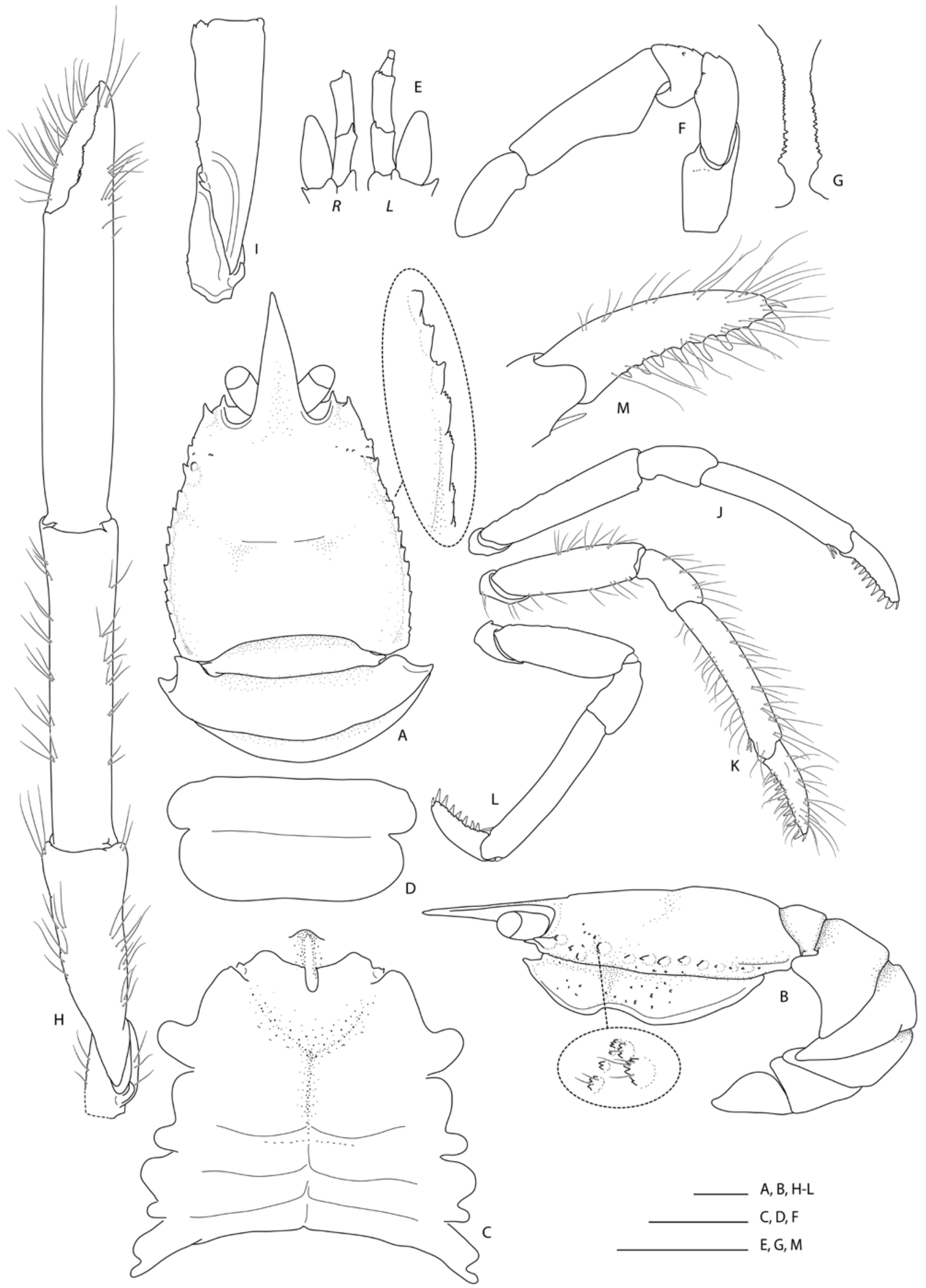


Figure 25. *Uroptychus ahyongi* **sp. nov.**, holotype, female, NIWA 106419: **A.** carapace and abdomen, dorsal, with expanded view of right posterior branchial lateral margin; **B.** carapace and abdomen, lateral, with expanded view of anterior branchial region of lateral carapace; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left and right Mxp3; **H.** right cheliped, dorsal; **I.** right cheliped ischiomerus, mesial; **J**–**L.** right P2–4; **M.** distal portion of propodus and dactylus, P2, lateral. Scale bars = 2 mm.

43°27.87′S, 179°45.85′W, 416–420.0, 30 Dec 2007, 1 female (8.8 mm, pcl 5.4 mm); NIWA 106426, NIWA Stn TAN0801/16, 43°27.87′S, 179°45.85′W, 416–420.0, 30 Dec 2007, 1 male (4.3 mm, pcl 2.6 mm; sequenced, see Fig. 5); NMNZ CR.023718, Fisheries Research Division Stn J01/7/81, 43°23.450′S, 178°34.700′W, 419–433 m, 1 Jan 1981, 2 female ov. (8.1, 7.8 mm, pcl 5.2, 4.8 mm), 1 male (7.0 mm, pcl 4.4 mm), 'on coral'.

Type locality. Bay of Plenty, 570 m.

Distribution. Eastern New Zealand, from Northland Plateau, Bay of Plenty, Hikurangi Margin to Chatham Rise, 297–625 m (Fig. 27).

Habitat. The typical habitat from which *U. ahyongi* **sp. nov.** has been collected seems to be soft sediments, but collection notes from three lots mention a possible host: NIWA 85532 was 'pulled off a sea pen', NMNZ CR.023718 was 'on coral' and NIWA 106426 was 'on isidid' bamboo coral.

Diagnosis. Carapace dorsal surface unarmed (at most with a few scattered small granules on hepatic region); stout anterolateral spine; lateral orbital spine subequal in size or larger than and over-reaching anterolateral spine; lateral margin with row of 9–12 regularly arranged small spines or short transverse rows of spinules along branchial margin, in addition to 1 or 2 sometimes obsolescent lateral hepatic spines. Rostrum narrow (width < 0.5 × distance between anterolateral spines); unarmed. Thoracic sternite 3 anterolaterally rounded, anterior margin with median notch, flanked by obsolescent submedian spines. Antennal article 2 with distinct distolateral spine; articles 4 and 5 bearing small to minute distal spine; antennal scale short, overreaching article 4 but not reaching beyond midlength of article 5. P2–4 propodi with distal pair of spines only along flexor margin. P2–4 dactyli distally narrowing (not truncate), with 7–11 loosely spaced spines (typically 9–11); arranged perpendicularly to flexor margin; penultimate spine slightly broader than antepenultimate spine, about twice size of ultimate spine.

Description. Carapace: 0.8–1.4 as long as wide, (typically [0.9]–1.0), moderately convex from side to side. Dorsal surface smooth; cervical groove indistinct (faintly indicated); unarmed except for a few scattered spines or granules in hepatic region (usually 1 spine near first branchial spine, preceded by few scattered granules or spines, at least in larger specimens). Lateral orbital spine sharp, larger than or equal to anterolateral spine. Anterolateral margin spine well-developed, does not reach lateral orbital spine; lateral margins convexly divergent posteriorly; with 9–12 spines (or processes) excluding anterolateral spine: 1 or 2 on hepatic margin; 1–3 on anterior branchial margin; 6–9 on posterior branchial margin; anterior branchial spine largest; posterolateral corner with distinct ridge. Rostrum narrow triangular (basal breadth < 0.5 × distance between anterolateral spines), horizontal, 0.4–0.7 × pcl (typically [0.6]–0.7); 1.8–2.1 × longer than wide at base; dorsal surface excavated; lateral margins smooth. Pterygostomian flap lateral surface granulate; anterior margin produced into a spine.

Thoracic sternum: Excavated sternum with convex anterior margin and slightly ridged midline [small anterior tubercle in holotype]. Sternal plastron 1.2 × as wide as long, widening posteriorly. Sternite 3 anterolaterally rounded; median notch present and submedian spines small to obsolescent; lateral margins produced to small spine; surface smooth. Sternite 4 2 × as wide as sternite 3, surface smooth, anteriorly deeply concave, anterior midline grooved; anterolateral margin rounded or with blunt terminus; lateral mid length unarmed; anterolateral margin distinctly longer than posterolateral margin. Sternite 5 anterolateral margin unarmed, rounded (may be irregular).

Abdomen: Tergites smooth and unarmed. All tergites without ridges. Telson 2.0 × as broad as long; posterior margin nearly straight (not or indistinctly emarginate); posterior portion 1.1 × length of anterior portion.

Eyes: Cornea subglobular, [0.4]–0.5 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine. Article 3 unarmed. Article 4 with small distal spine; mesial margin unarmed. Article 5 armed with small distomesial spine (sometimes minute); mesial margin unarmed; 1.1–1.4 [1.1, 1.3] × as long as article 4. Antennal scale reaching to midlength of article 5, or slightly overreaching article 4; 2.0–2.3 [2.0, 2.2] × as long as wide.

Maxilliped 3: Coxa and basis unarmed. Merus and ischium with surface smooth, ischium without distal spines; 20–30 denticles on crista dentata (diminishing in size distally). Merus extensor margin at most with small distal spine; flexor margin with several acute tubercles at mid length. Carpus extensor margin with 3 or 4 small spines.

Cheliped: Slender; 2.9–5.8 [4.8] × as long as pcl (mostly between 3.8–5.0 × pcl); surface moderately setose with tufts of setae. Ischium with dorsal distal spine. Merus surface sometimes with a few small scattered spines along mesial surface, always with 1 or 2 distinct granules along distal margin of ischium; distoventral margin with 0–2 small spines. Carpus surface smooth; unarmed distally; length 0.8–1.2

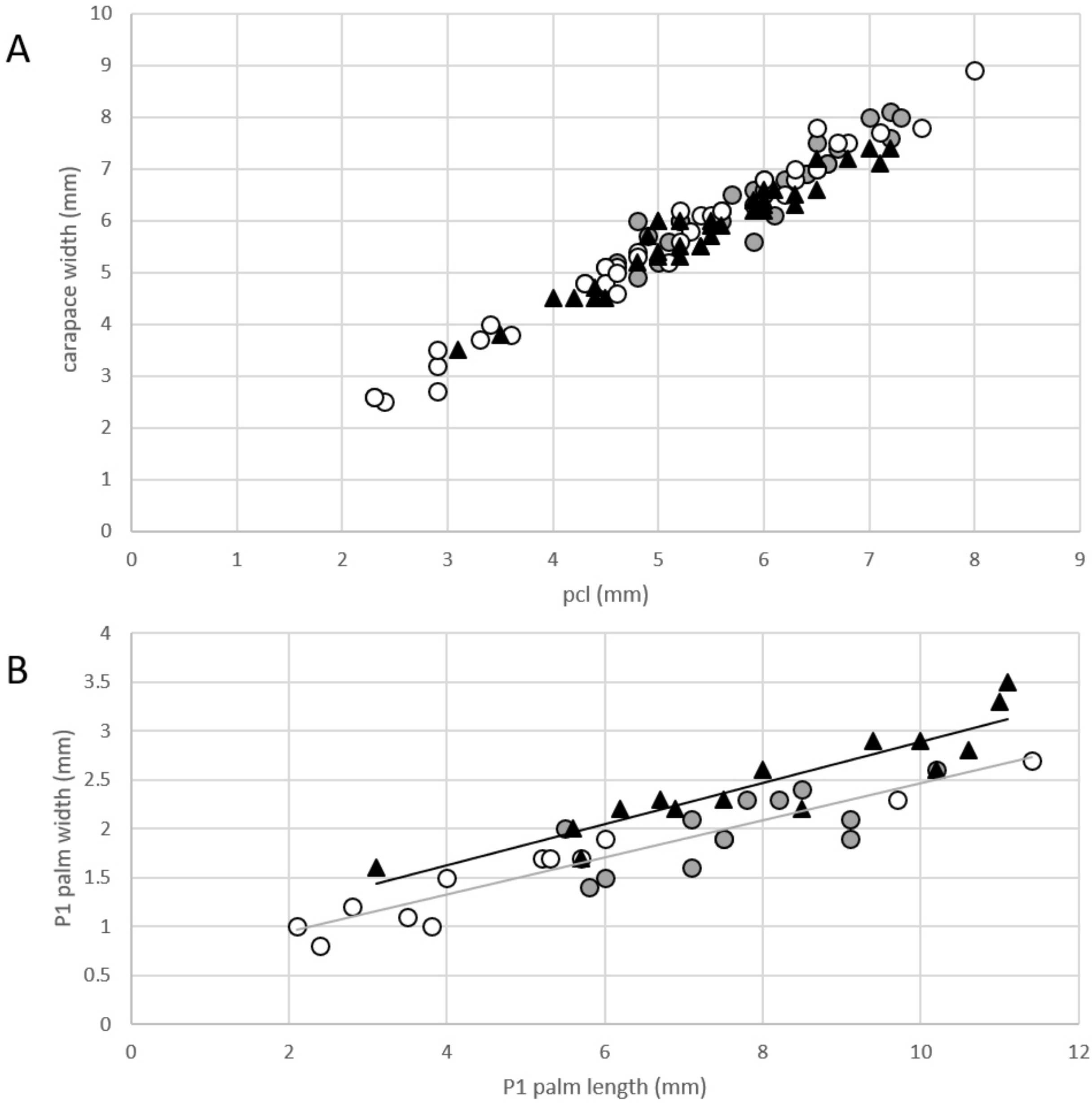


Figure 26. Comparative meristics for *Uroptychus ahyongi* **sp. nov.** of males (black triangles), females (white circles) and ovigerous females (grey circles): **A.** postorbital carapace length (pcl) versus carapace width. **B.** cheliped (P1) palm length versus palm width. Trendline for males is black and for females is grey.

[1.0] × that of palm. Palm 1.9–4.8 [4.2] × as long as wide, unarmed. Dactylus [0.4]–0.5 × propodus length; occlusal margins denticulate, without gape.

Pereopods 2–4: Similar; surface setose with tufts of setae. Merus dorsal margin unarmed, relatively smooth or slightly irregular; ventral margin without spines or with distal spine [P2 and P3 with small distal spine]. P4 merus 0.8 × as long as P2 merus; shortest merus pereopod 4. Merus 1–0.7 × as long as propodus (from P2–P4), with propodi lengthening. Carpus unarmed. Propodus 5.5–6.1 × longer than wide; extensor margin smooth; flexor margin with only distal pair of spines, distally not inflated; 1.9–2.2 × as long as dactylus. Dactylus nearly straight; flexor margin with 7–11 movable spines along entire length (typically 9–11), all sharp triangular, penultimate spine about double width of ultimate spine, slightly larger than antepenultimate; ultimate and penultimate spines close to each other; remaining spines loosely arranged along flexor margin.

Ovum. Diameter 0.9–1.3 mm, up to 50+ eggs.

Colour in life. Collection notes include 'pink' (NIWA 85532), 'white' and 'no colour' (NMNZ CR.025200 and CR.025201, respectively).

Etymology. Named in honour of Shane Ahyong, Australian Museum in Sydney, for his contributions to crustacean taxonomy and systematics, and with gratitude for his mentoring and friendship.

Remarks. *Uroptychus ahyongi* **sp. nov.** can be easily identified by the long smooth rostrum, the regular spination along the lateral margin of the carapace, the rounded anterolateral margin of sternite 4, the nearly entirely unarmed cheliped (a distinct granule is situated at the mesial margin of the merus, adjoining the distal portion of the ischium, Fig. 25I), the unarmed P2–4 propodus flexor margin (except distal pair) and dactyli with typically 9–11 sharp triangular spines that appear to be directed perpendicular to the flexor margin. The spination of the antennal article 5 and the merus of the cheliped vary. The spine on antennal article 5 may be distinct or minute but is usually present. The spine on antennal article 4 is always present. The merus of the cheliped may have a small spine distomesially and/or distolaterally or may bear no spines distally but the ischium always bears a dorsal spine while unarmed ventrally, and the merus bears 1 or 2 distinct granules mesially where it meets the ischium. Variation in spination along the carapace lateral margin, the pterygostomian flap or the maxilliped may be linked to the size of specimens, with additional fields of spines and granules in the hepatic region of the carapace in some of the larger specimens (e.g. NIWA 76362 ovigerous female pcl 5.9 mm, NMNZ CR.023795 ovigerous female pcl 7.3 mm). The lateral margin is furnished with simple small spines in small specimens, but these often form short serrated ridges with small conical tips in large specimens (as illustrated for the female holotype, Fig. 25A inset). The smallest specimen is a female with a pcl of 2.3 mm, the smallest ovigerous female is 4.3 mm while the smallest male has a pcl of 3.1 mm. The largest specimen was the female holotype (pcl 8.0 mm) and the largest males have a pcl of 7.2 mm. The carapace proportions of both males and females do not change with size and there is no indication of sexual dimorphism (Fig. 26A). However, the cheliped length is typically sexually dimorphic in squat lobsters and apparent in this species, albeit slight. The male cheliped is increasingly longer than the female cheliped for larger specimens (pcl ≥ 6.0 mm), but irrespective of size, the male palm is always comparably more massive than that of a female as measured by the palm height-width ratio (Fig. 26B).

An unusual variation, most likely due to an injury, is a proximally contricted rostrum in an ovigerous female (NIWA 23337, pcl 5.9 mm). Rhizocephalan externa were found in a few specimens (NIWA 23336, 23337, 23353 and NMNZ CR.16815).

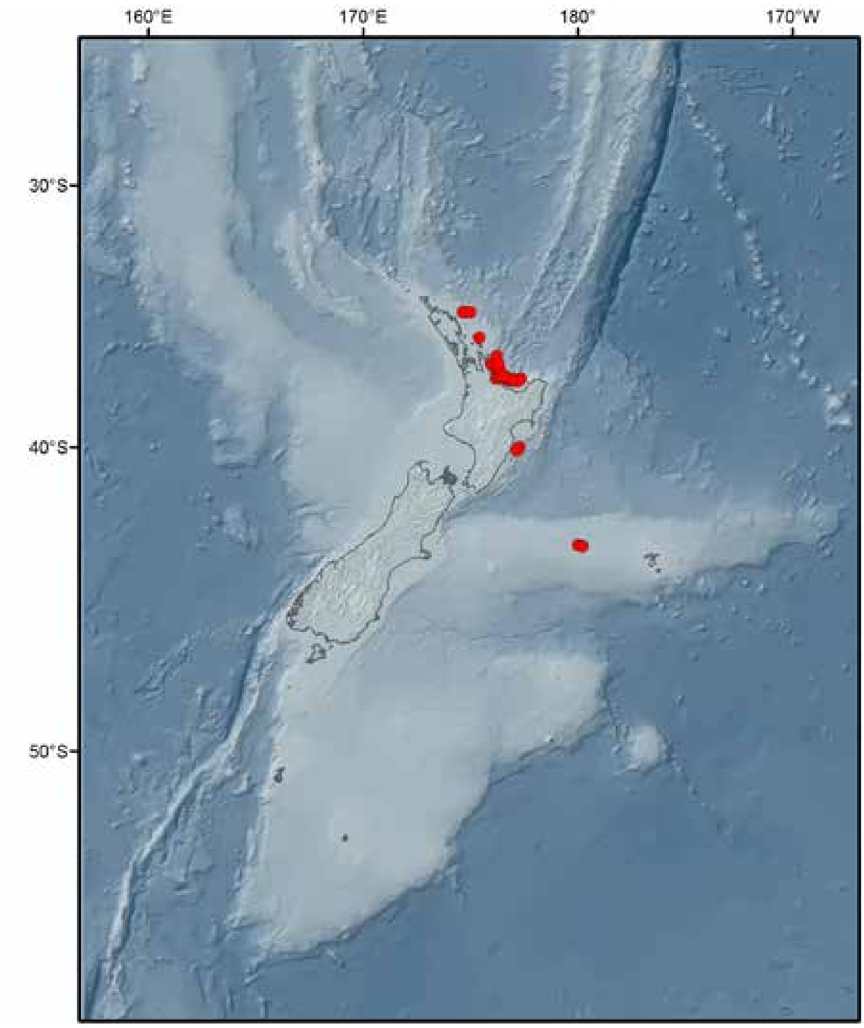
Uroptychus ahyongi **sp. nov.** is morphologically similar to *U. spinosior* Baba, 2018 and *U. annae* Baba, 2018, both also from New Zealand, based on the carapace shape and presence of lateral spines, the ornamentation of the walking legs (distal pair of spines on propodi, relative proportions of spines and perpendicular arrangement), and the pterygostomian flap having a sharp anterior spine and spinules at least on the anterior portion as well as a mostly unarmed cheliped. Some key diagnostic features that distinguish *U. ahyongi* **sp. nov.** from both of these are: the unarmed rostrum (with a pair of subapical spines for both *U. spinosior* and *U. annae*); the anterolateral spine that is overreached by and subequal or smaller than the lateral orbital spine (the anterolateral spine is clearly larger and overreaches the lateral orbital spine in *U. spinosior* and *U. annae*); the antennal scale is short and never reaches the end of the peduncle, and distal two articles of the peduncle are furnished with a small distal spine (the antennal scale clearly overreaches the peduncle and both articles bear strong distal spines in *U. spinosior* and *U. annae*); the anterolateral margin of thoracic sternite 3 is laterally rounded and the Mxp3 lacks strong spines on all articles (thoracic sternite 3 is anterolaterally acute and the Mxp3 bears strong spines on the ischium, merus, and carpus in *U. spinosior* and *U. annae*).

Uroptychus ahyongi **sp. nov.** could be confused with *U. yaldwyni* Schnabel, 2009 from the Kermadec Ridge but differs in the comparatively longer rostrum, typically 0.6–0.7 × pcl versus 0.4 × pcl; *U. yaldwyni* has 6–8 lateral carapace spines in addition to the anterolateral spine, while *U. ahyongi* **sp. nov.** typically has 8–10 spines on the branchial margin alone, and two additional small spines in the lateral hepatic region. The anterior margin of the thoracic sternite 3 is round in *U. ahyongi* **sp. nov.** (versus acute in *U. yaldwyni*) and the dactyli of the walking legs bear more flexor marginal spines in *U. ahyongi* **sp. nov.**, typically 9–11 (7 in the very smallest specimens), compared to 5 or 6 spines in *U. yaldwyni*.

Genetically, *U. ahyongi* **sp. nov.** is closely aligned with *U. enriquei* Baba, 2018 and *U. tomentosus* Baba, 1974, both also known in the New Zealand region. They share characters such as the short, rounded antennal scale and nearly entirely unarmed cheliped and walking legs, but *U. ahyongi* **sp. nov.** is easily distinguished from these by the spines along the lateral carapace margin and pterygostomian flap (unarmed in both *U. enriquei* and *U. tomentosus*) and the number of spines on the P2–4 dactyli, which always exceeds 7 in *U. ahyongi* **sp. nov.** but is 6 or fewer in both *U. enriquei* and *U. tomentosus*.

Over 300 specimens of *U. ahyongi* **sp. nov.** have been collected and 273 are included in this monograph,

Figure 27. Distribution of *Uroptychus ahyongi* **sp. nov.** around New Zealand.



making it one of the most adundant New Zealand species known. Most of the specimens were collected on two surveys, the Victoria University Wellington Marine Department Prawn Survey of 1962 and the Northern Prawn Cruise of 1968/69, both of which sampled around the south-western Bay of Plenty Islands from the Alderman island group to White Island. These specimens account for around half of the material examined.

By comparison, very few specimens have been collected outside of the Bay of Plenty (Northland Plateau, 5; Hikurangi Margin, 2; Chatham Rise, 5) and few have been collected since 2000. The most recent Bay of Plenty scampi voyages (2000 voyage KAH0001 and 2012 voyage KAH1205), and Chatham Rise fisheries voyages (2008 voyage TAN0801 and 2010 voyage TAN1008) sampled these areas well but few specimens were collected. Why this species is not collected more frequently in these locations is unknown.

DNA sequence data. Intraspecific sequence divergence for partial CO1 gene: 0.4–1.2% (NIWA 76362, 85532, 106426). Closest interspecific sequence divergence: 12.8–13.3% (*U. enriquei* Baba, 2018, two specimens).

ZooBank registration. *Uroptychus ahyongi* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:09A85CF4-6152-4925-BBB4-5D3CF6AA3EC9.

Uroptychus alcocki Ahyong & Poore, 2004

Figs 28–30

Uroptychus alcocki Ahyong & Poore, 2004: 15, fig. 2; Baba 2005: 28, figs 6, 223 (synonymies, key); Baba *et al.* 2008: 27 (list and synonymies); Schnabel 2009a: 549, fig. 5; Schnabel 2009b: 25 (list); Rowden *et al.* 2010: 75 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 207 (list); Poore *et al.* 2011: 328, plate 6A; Baba 2018: 49, fig. 9.

Type & locality (not examined). Holotype—AM P31412, south-east of Ballina, New South Wales, Australia, 29°02′S, 153°48′E, 137 m, female (cl 9.0 mm).

Material examined. *New Zealand*, *Norfolk Ridge*: NMNZ CR.012074, NIWA Stn TAN0308/20, 29°41.83′S, 168°02.62′E, 337–322 m, 14 May 2003, 1 female ov. (cl 8.5 mm) (see ship-board image Fig. 28).

New Zealand, *Bay of Islands*: NIWA 55590, NIWA Stn TAN0906/93, 34°49.81–49.87′S, 173°53.64–53.95′E, 149–151 m, 9 Jul 2009, 1 female ov. (7.8 mm,

Figure 28. Live specimen photos of *Uroptychus alcocki* Ahyong & Poore, 2004 collected in New Zealand: left, female ov., NIWA 55590, Northland Plateau, pcl 5.1 mm; right, female ov., NMNZ CR.012074, Norfolk Ridge (Australian EEZ), pcl 5.8 mm. Scale bars = 5 mm. Photo credit: Rob Stewart, NIWA (left), Karen Gowlett-Holmes, CSIRO (right).

pcl 5.1 mm; see ship-board image Fig. 28; sequenced, see Fig. 5).

New Zealand, *North Cape*: AKM MA101513, repeat of H.M.S. *Terra Nova* Stn BS4021, 34°24′S, 173°5′E, 165–143 m, 20 Feb 1974, 1 female ov. (6.9 mm, pcl 4.7 mm).

Vanuatu: NMNZ CR.019812, RV *Akademic Alexander Nesmeyanov*, 16°39.50′S, 168°21.50′E, Epi Island, Vanuatu, 450–410 m, 5 Apr 1990, 1 female ov. (7.9 mm, pcl 5.5 mm).

Distribution. Widespread throughout southwest Pacific, New South Wales, Queensland, Tasman Sea, 137–419 m (Ahyong & Poore 2004); Formosa Channel and Japan, 64–192 m (Baba 2005), Lord Howe, Norfolk and Kermadec Ridges, 69–490 m (Schnabel 2009a); Solomon Islands, Chesterfield Islands, Vanuatu, Loyalty Islands, New Caledonia, Norfolk Ridge, and Hunter-Matthew Islands, 167–780 m (Baba 2018); Northland, New Zealand143–165 m (Fig. 30).

Habitat. Some specimens were preserved clinging to small pieces of gorgonian coral (NIWA 10893, NIWA 23031 and NIWA 23032) (Schnabel 2009a), and Baba (2018) listed 17 samples collected with a range of corals (chrysogorgiids, isidids, nidaliids, acanthogorgids, an unidentified coral) and hydroids.

Diagnosis. Carapace epigastric region smooth; lateral margins subparallel, with anterolateral spine, lateral spine at base of indistinct cervical groove and usually with small spine at anterior margin of branchial region. Rostrum very broad, about two-third distance between base of anterolateral spines, as long as broad, lateral margins straight. Anterior margin of thoracic sternite 3 with pair of submedian spines. Posterior plate of telson semicircular, not emarginate. Eyes not extending beyond (but nearly reaching) tip of rostrum; cornea subglobular. Cheliped propodus palm entirely granular; carpus, merus, and ischium with distinctly granular ventral surfaces, subcylindrical; merus not proximally narrowed (not bowling-pin shaped); ischium with short distodorsal spine. P2–4 carpi and meri unarmed along dorsal margin; propodi with row of 5–10 flexor marginal spines, distalmost paired; dactyli with large, sharp triangular, slightly inclined and widely spaced spines along flexor margin; distalmost group similar in size.

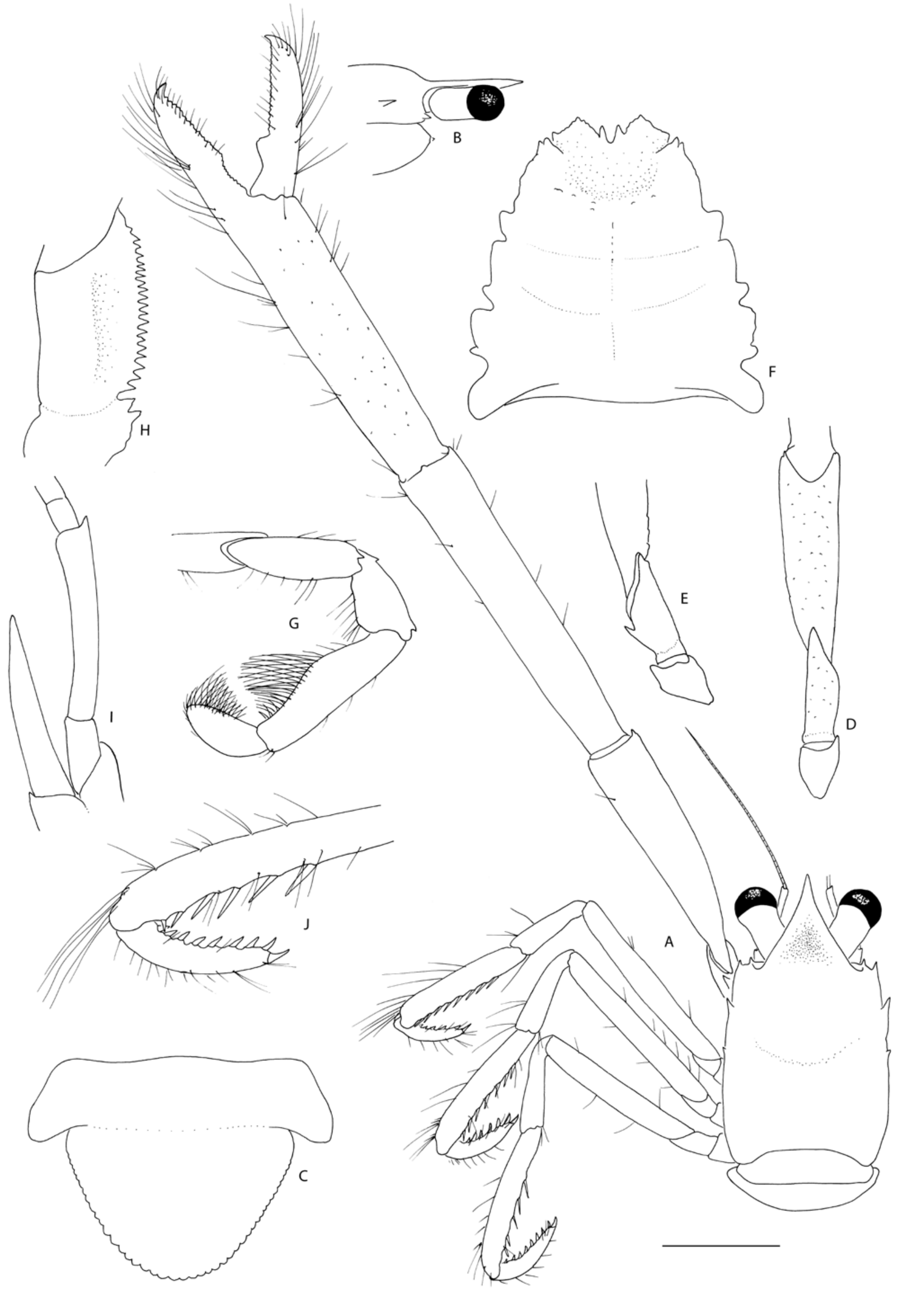
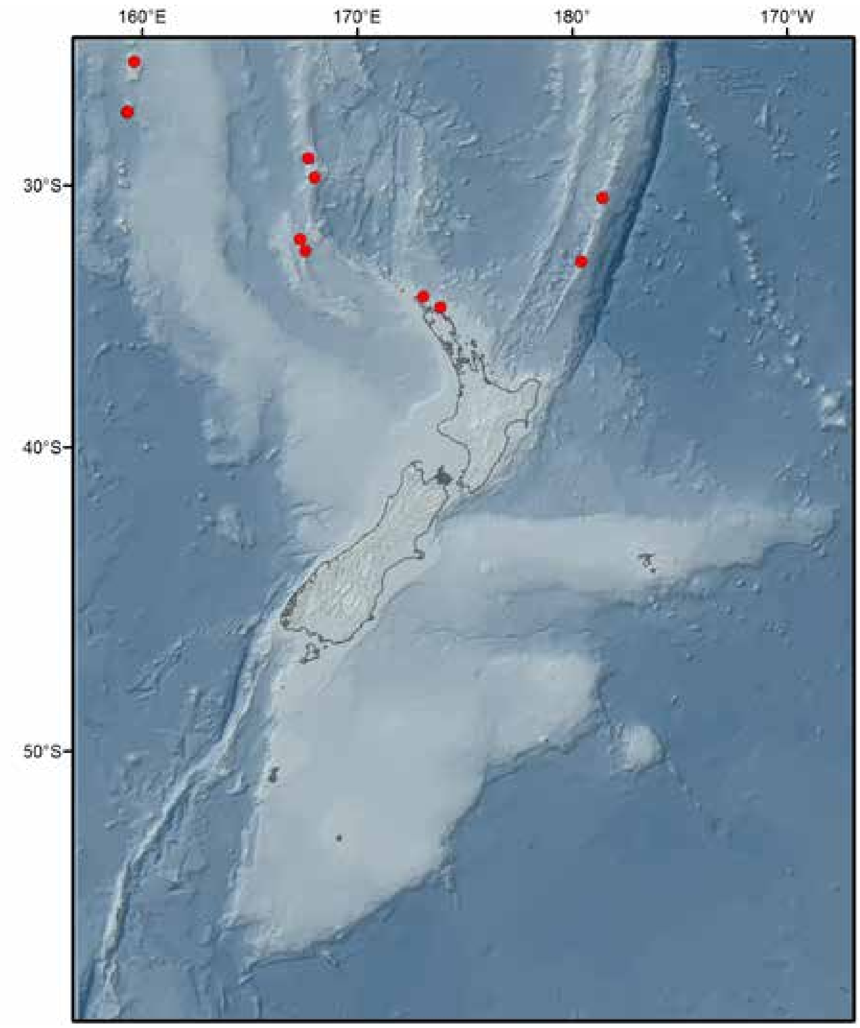


Figure 29. *Uroptychus alcocki* Ahyong & Poore, 2004, female, cl 4.8 mm, AM P31411 (E of Capricorn, Queensland): **A.** dorsal habitus; **B.** anterior carapace, right lateral; **C.** telson; **D.** cheliped proximal articles, right ventral; **E.** cheliped, proximal articles, lateral; **F.** sternum; **G.** Mxp3, right lateral; **H.** crista dentata, right. **I.** antenna, right ventral; **J.** P4 dactylus and distal propodus. Scale A–E = 2 mm, F = 1 mm, G–I = 0.6 mm. Kindly provided by Shane Ahyong (AM).

Figure 30. Distribution of *Uroptychus alcocki* Ahyong & Poore, 2004 around New Zealand.



Colour in life. Body nearly entirely transparent, with line of iridescent chromatophores along midline more or less distinct (Fig. 28). Cornea pale (Fig. 28, left), transparent (Fig. 28, right) or darkly pigmented (Poore *et al*. 2011: pl. 6, fig. 1).

Remarks. Four specimens of *U. alcocki* are added to to the material previously reported by Schnabel (2009a) from Lord Howe, Norfolk, and Kermadec Ridges. All specimens correspond to the original description by Ahyong & Poore (2004) and more recent records presented by Baba (2018). However, Schnabel (2009a) already noted that the ocular peduncle of the specimens examined is typically wider than illustrated for the holotype and more similar to that illustrated for a New Caledonian specimen by Baba (2018) which corresponds to a specimen from off northern Queensland, Australia, reported by Shane Ahyong (Fig. 29).

Uroptychus alcocki is easily distinguishable from all its congeners in the New Zealand region by its wide rostrum (about as long as wide, and its basal width being about two-thirds the distance between the anterolateral spines), elongate eyes (nearly reaching the tip of the rostrum), the single strong spine along the lateral carapace margin (1 or 2 obsolescent spines may be present along the posterior branchial margin), the semicircular telson and up to 10 movable spines along the propodus flexor margin of the walking legs. It is most similar to *U. yokoyai* Ahyong & Poore, 2004, originally described from the western Tasman Sea and subsequently reported widely throughout the southwestern Pacific by Baba (2018) including the Norfolk Ridge to nearly 25°S. *Uroptychus alcocki* differs from *U. yokoyai* in that sternite 3 bears a distinct pair of submedian spines (unarmed in *U. yokoyai*) and the shape of the cheliped merus which is proximally narrowed, "representing a unique shape like a bowling pin" (Baba 2018: 564).

According to Baba (2018), this is the most common species in the western Pacific and it has been reported from eastern Australia to Japan, the south Pacific islands (Solomon Islands, Vanuatu, Chesterfield Islands, New Caledonia, Loyalty, and Hunter-Mathews Islands and Lord Howe, Norfolk, and Kermadec Ridges and now the northernmost New Zealand continental shelf).

Uroptychus latirostris, also reported from Norfolk Ridge, Hunter-Matthew Islands to 22–23°S (Baba 2018) also resembles *U. alcocki* but is closer to *U. yokoyai* in that it lacks the median notch and submedian spines on the anterior margin of thoracic sternite 3.

Notably, *U. alcocki* is nested within a group of 'smooth' species with a narrow rostrum according to preliminary phylogenetic analysis of CO1 sequences (Fig. 5). These 'smooth' species, including *U. remotispinatus*, *U. maori,* and *U. nigricapillis* share similar distal P2–4 dactyli spination with the spines all subequal in size, rows of spines along the P2–4 propodal flexor margin, and the presence of submedian spines on the anterior sternite 3.

DNA sequence data. Interspecific sequence divergences for partial CO1 gene: 7.8–7.3% (*U. remotispinatus*, four specimens), 8.5% (*U. maori*, two specimens), 9.3–10.0% (*U. nigricapillis*, 3 specimens).

Uroptychus annae Baba, 2018 — Figs 31, 32

Uroptychus tridentatus. Baba 2005: 61 (part), fig. 21.
Uroptychus annae Baba, 2018: 61, figs 14, 15.

Type & locality (not examined). Holotype—MNHN-IU-2014-17285, MUSORSTOM 8 Stn DW1100, 15°04.72′S, 167°09.99′E, Vanuatu, 258–265 m, female (pcl 4.2 mm).

Material examined. *Norfolk Island (Australian EEZ)*: NIWA 23358, NZOI Stn I85, 29°07.90′S, 168°15.00′E, 290 m, 22 Jul 1975, 1 female (3.9 mm, pcl 2.5 mm), 1 male (3.4 mm, pcl 2.2 mm).

North Norfolk Ridge (Australian EEZ): NMNZ CR.025209, NORFANZ Stn TAN0308/19, 29°41.46′S, 168°03.48′E, 339–344 m, 14 May 2003, 1 male (3.3 mm, pcl 2.2 mm).

Distribution. Vanuatu, Loyalty Islands, New Caledonia, Norfolk Ridge, Grand Récif du Sud, and Hunter-Matthew Islands, 248–460 m (Fig. 32).

Habitat. Unknown.

Diagnosis. Carapace unarmed on dorsal surface, smooth or at most feebly granulose on anterior half of dorsal surface; anterolateral spine prominent and overreaching smaller lateral orbital spine; lateral margin with 2 hepatic spines and 4 or 5 branchial spines. Rostrum basal breadth less than half the distance between anterolateral spines; with pair of subapical spines. Thoracic sternite 3 anterolaterally acute. Ocular peduncles distally narrowed. Antennal article 2 with distinct spine; articles 4 and 5 each with strong distal spine; antennal scale acute, overreaching peduncle. Cheliped merus with a few small spines ventrally and mesially. P2–4 meri ventrolaterally lobate (not acuminate); propodi without marked projection on flexor margin, with distal pair of spines and 1–3 proximal spines might be present; dactyli distally narrowed, not truncate, with 6 loosely arranged flexor marginal spines, distal third, fourth, fifth spines perpendicular to flexor margin; penultimate spine much broader than ultimate, nearly as large as or slightly larger than antepenultimate.

Colour in life. Not known.

Remarks. Baba (2018) referred the southwestern Pacific material previously identified as *U. tridentatus* (Henderson 1885) by Baba (2005), to his new species, *U. annae*, while retaining the equatorial western Pacific material in *U. tridentatus sensu stricto*.

The three small specimens collected from off Norfolk Island are close to *U. tridentatus*, but are referred to *U. annae,* based on the diagnostic characters of the P2–4 propodi with fewer spines proximal to the distal pair (one to three in *U. annae* compared to five to six in *U. tridentatus*), the P2–4 dactyli with fewer spines along the flexor margin (six for *U. annae* and eight for *U. tridentatus*) and the ventrolateral margins of the P2–4 meri are lobate, not acute as in *U. annae* and acuminate in *U. tridentatus*. Baba (2018) also suggests that a difference is in the relative position of the posteriormost spine along the lateral carapace margin, with *U. annae* having the last spine more remote (at one-third) from the posterior end of the carapace and *U. tridentatus* having spines up to about the distal quarter portion of the lateral carapace margin. This difference is not supported by the specimens examined here, which have five branchial spines with the posteriormost being smaller but distinct and situated about one-fourth of the distance from the posterior margin.

The specimens examined here show some variation compared to previous accounts of *U. annae*:

- the lateral branchial margin of the carapace has five spines in the female and six spines (one additional small spine is situated behind the first branchial spine) in the male. The type has four lateral branchial spines (Baba 2018: fig. 20);
- the dorsal ridges of the meri of all the walking legs are serrated in the proximal half. Baba (2018) mentions some proximal spines on P2 and sometimes present on P3 but obsolete on P4;
- the P2–4 carpi have a small dorsodistal spine in both specimens from NZOI Stn I85, but the description of *U. annae* indicates the carpus is entirely unarmed;
- the P2–4 propodi flexor margin is entirely unarmed other than the distal pair of spines on the P2 in the female and P3–4 in the male. The remaining legs bear a single spine at approximately the distal quarter of the flexor margin. The description of *U. annae* indicates that the P4 propodus might only have a distal pair of spines but the other legs have 1–3 spines along the flexor margin.

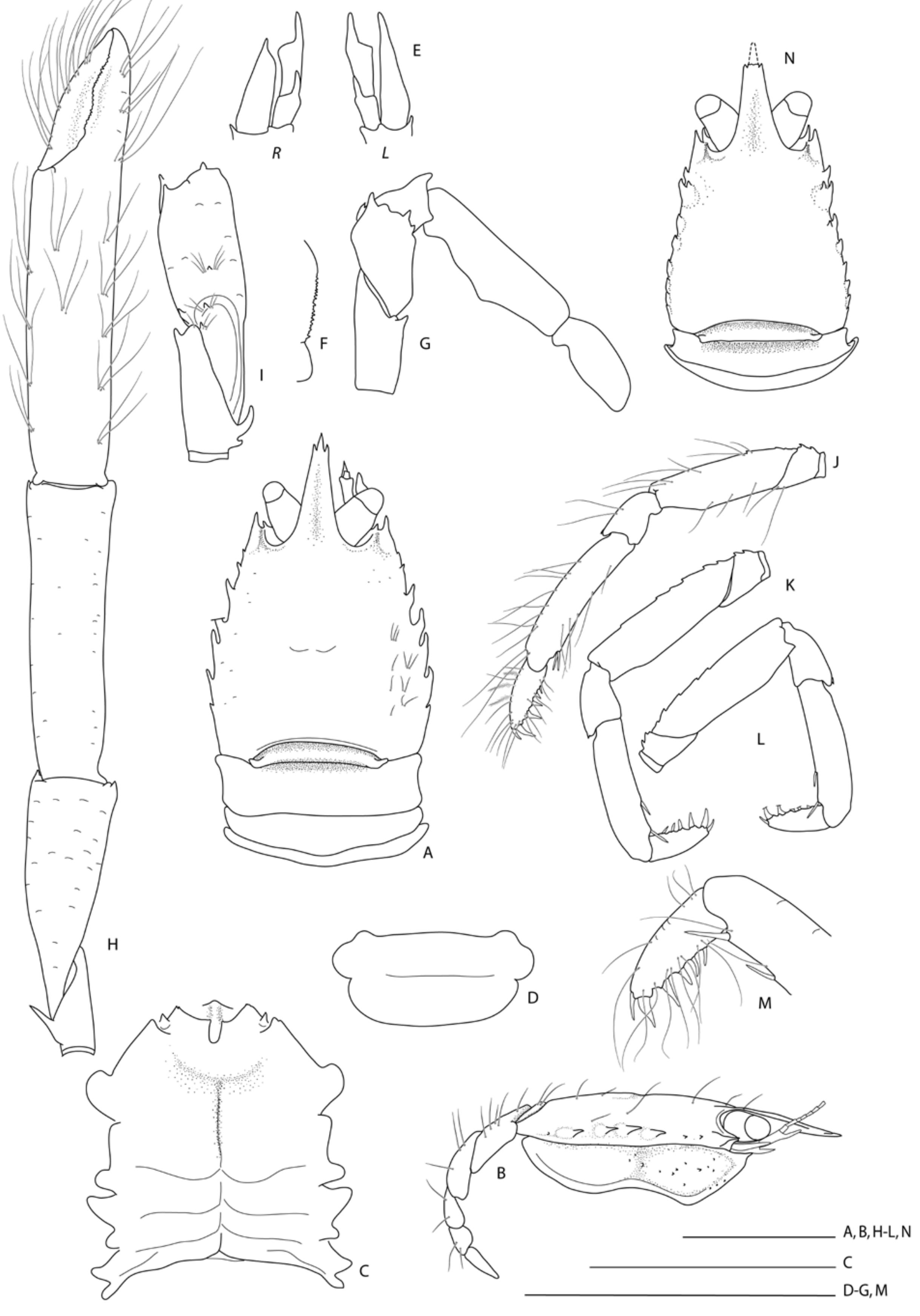
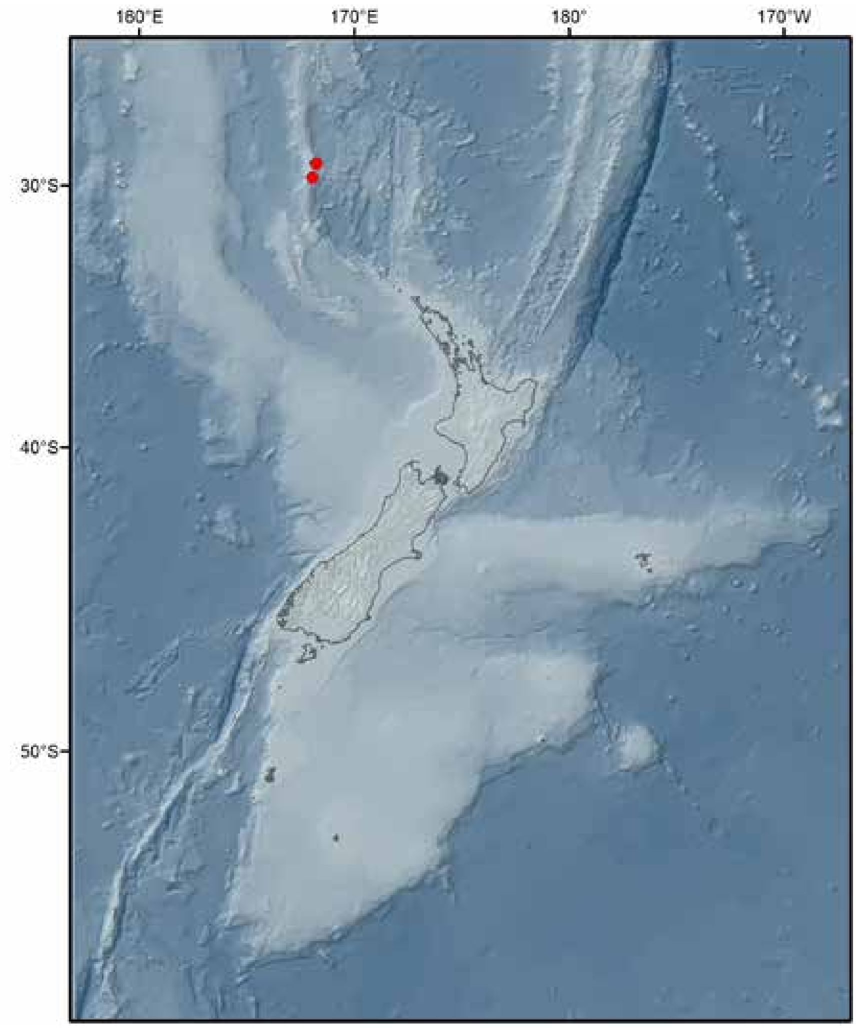


Figure 31. *Uroptychus annae* Baba, 2018, A–M, female, NIWA 23358; N, male, NMNZ CR.025209: **A**, **N.** carapace and abdomen dorsal; **B.** carapace and abdomen, lateral, select setae illustrated; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, ventral; **F.** crista dentata of Mxp3, left, lateral, setae omitted. **G.** endopod of Mxp3, left; **H.** right cheliped, dorsal; **I.** right cheliped, ischium and merus, lateral; **J**, **K.** detached right pereopods 2 or 3; **L.** right pereopod 4; **M.** dactylus and distal portion of propodus of right pereopod 2 or 3, lateral. Scale bars = 2 mm.

Figure 32. Distribution of *Uroptychus annae* Baba, 2018 around New Zealand.



Otherwise, the morphometric measurements of the New Zealand specimens conform well to those presented by Baba (2018), including the sexual dimorphism of the cheliped length (the male and female chelipeds are 5.3 and 5.0 × pcl and the palm length-width ratios are 2.8 and 3.6, respectively). The single male from NORFANZ Stn TAN0308/19 (NMNZ CR.025209), differs in some respects from the specimens collected around 64 km south at NZOI Stn I85 (NIWA 23358) (Fig. 31N). The carapace lateral margins are not distinctly convex but rather posteriorly widening as would be more typical of *U. tridentatus*, with the posteriormost portion bearing small spines along nearly the entire length. The hepatic region bears a stronger spine than previously illustrated and both anterior branchial spines have a second spine situated mesially. Also, the lateral orbital spine is large, overreaching the anterolateral spine, but is smaller and overreached by the anterolateral spine for both *U. annae* and *U. tridentatus*. However, the specimen is damaged and missing appendages and on balance it most closely resembles *U. annae*. *U. annae* most resembles *U. ahyongi* **sp. nov.** and *U. spinosior* Baba, 2018. Differences between these are discussed under those species.

Uroptychus anomalus **sp. nov.** Figs 33–35

Material examined. Holotype NMNZ CR.1859, 14 miles E of White Island, (estimated 37°35′S, 177°40′E), Bay of Plenty, 192 m, 3 Apr 1963, NZ Marine Dept. Prawn survey, col. R.B. Pike, female ov. (6.0 mm, pcl 4.0 mm). **Paratype** *Bay of Plenty*: NMNZ CR.025210, VUW Stn Haul 14, 8 miles E of White Island, estimated 37°31′S, 177°20′E, 549–629 m, 30 Sep 1962, 1 female ov. (6.3 mm, pcl 4.2 mm).

Type locality. 14 miles E of White Island, Bay of Plenty, 192 m.

Distribution. Bay of Plenty, 192–629 m (Fig. 35).

Habitat. Unknown.

Diagnosis. Carapace dorsal surface smooth, anterior half sub-quadrate in appearance, with large anterolateral spine, larger than lateral orbital spine, both distinctly separated. Lateral margins sub-parallel, unarmed or with 1 or 2 spines on branchial margin. Dorsal margin of orbit relatively broad; entire cornea visible in dorsal view. Rostrum width less than half as wide as carapace at its base. Sternal plastron rounded V-shaped anteriorly, sternites 3 and 4 rounded anterolaterally. Eyes distally narrowed,

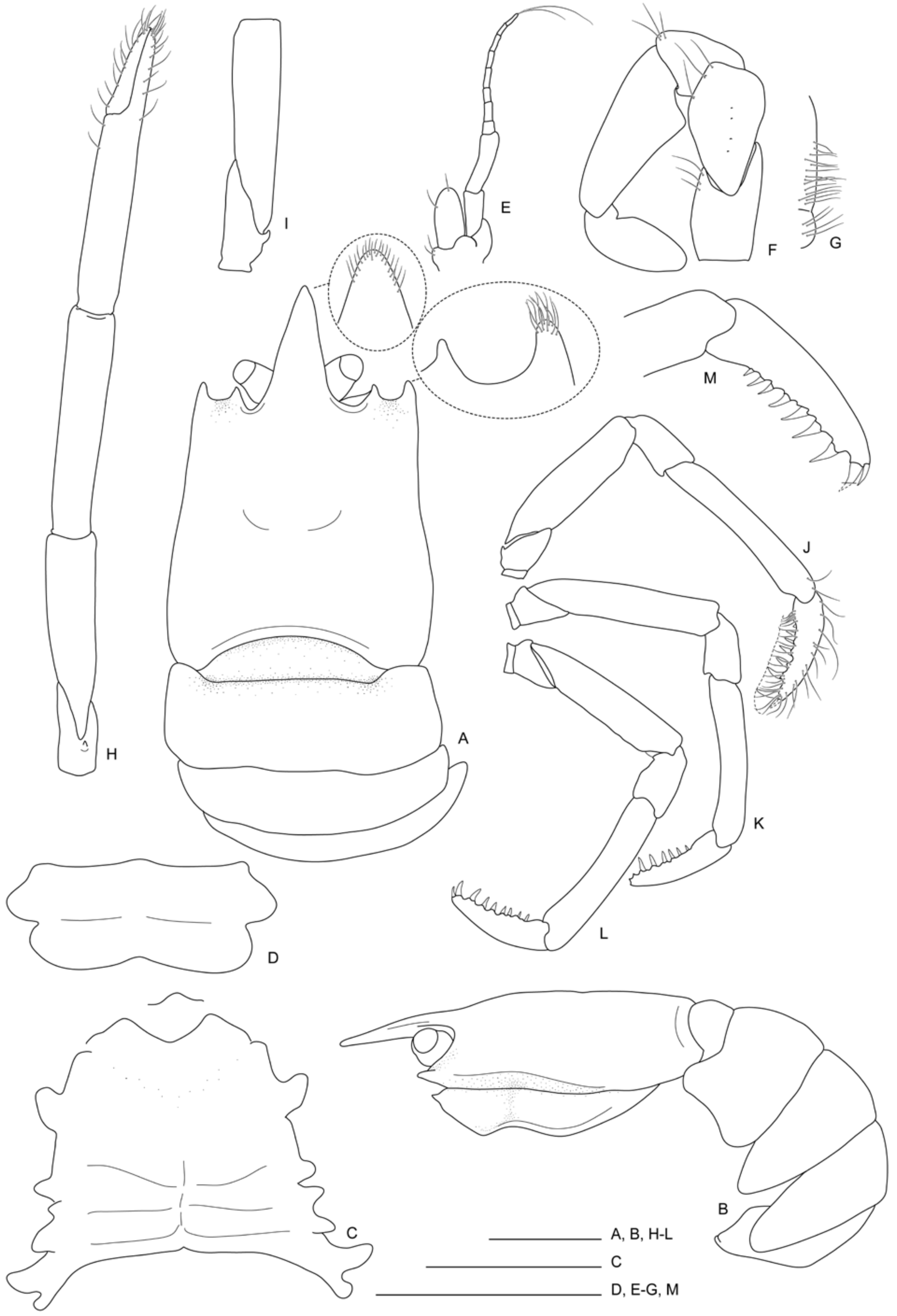


Figure 33. *Uroptychus anomalus* **sp. nov.**, holotype, female, ov. NMNZ CR.1859: **A.** carapace and abdomen dorsal, insets showing the tufts of setae on distal tips of rostrum and anterolateral spines; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, ventral, right; **F.** endopod of Mxp3, left; **G.** crista dentata of Mxp3, right; **H.** right cheliped, dorsal; **I.** right cheliped, ischium and merus, mesial; **J.–L.** right P2–4; **M.** dactylus and distal portion of propodus of lose right pereopod, lateral. Scale bars = 2 mm.

short. Pterygostomian flap surface smooth. Antennal peduncle unarmed, article 5 not broadened distally, narrower than antennal scale; scale reaching or slightly overreaching article 4. Cheliped unarmed except for small distodorsal spine on ischium. P2–4 entirely unarmed on meri, carpi and propodi. Dactyli distally narrowed; flexor margin with 8–9 sharp spines, arranged regular (equidistant) and perpendicular to margin, similar spination on P2–4; penultimate spine much broader than ultimate spine, slightly larger than antepenultimate.

Description. Carapace: pcl 0.8–[0.9] × width, shallow convex from side to side. Dorsal surface smooth; cervical groove indistinct (faintly indicated); unarmed. Lateral orbital spine sharp, smaller than anterolateral spine. Anterior half subquadrate in dorsal view, with well-developed anterolateral spine, furnished with terminal tufts of setae. Lateral margins subparallel, slightly convex in posterior half, with [0]–2 spines (excluding anterolateral spine); one lateral spine in anterior and posterior branchial region may be present or absent; posterior spine, if present, largest. Rostrum narrow triangular (breadth < 0.5 × distance between anterolateral spines), horizontal, 0.5 × length of remaining carapace; 1.4 × longer than wide at base; dorsal surface covered with fine setae, furnished with tufts of short fine setae distally; lateral margins smooth. Pterygostomian flap lateral surface smooth; anterior margin produced into spine.

Thoracic sternum: Excavated sternum anteriorly rounded and barely ridged along midline. Sternal plastron 1.4–[1.5] × as wide as long, surface smooth, widening posteriorly. Sternite 3 anterolaterally rounded, anterior margin concavely excavated, without median notch and submedian spines. Sternite 4 1.7 × as wide as sternite 3, anteriorly shallow concave, anterior midline ungrooved; anterolateral and lateral margins unarmed, anteriorly not produced; length of anterolateral and posterolateral margins subequal.

Abdomen: Tergites smooth and unarmed. Abdominal tergite 1 with slight ridge at posterior margin; remaining tergites without ridges. Pleural margins of somites 2–4 rounded. Telson width 2.5 × length; posterior margin emarginated; posterior portion same length as anterior portion.

Eyes: Cornea subglobular, distally narrowing; 0.3 × length of ocular peduncle.

Antennal peduncle: All articles unarmed; article 2 laterally [rounded] or blunt angular. Article 5 1.4–[1.5] × as long as article 4. Antennal scale [reaching] or slightly overreaching article 4; [2.1]–2.2 × as long as wide.

Maxilliped 3: All articles unarmed. Crista dentata and basis lacking denticles.

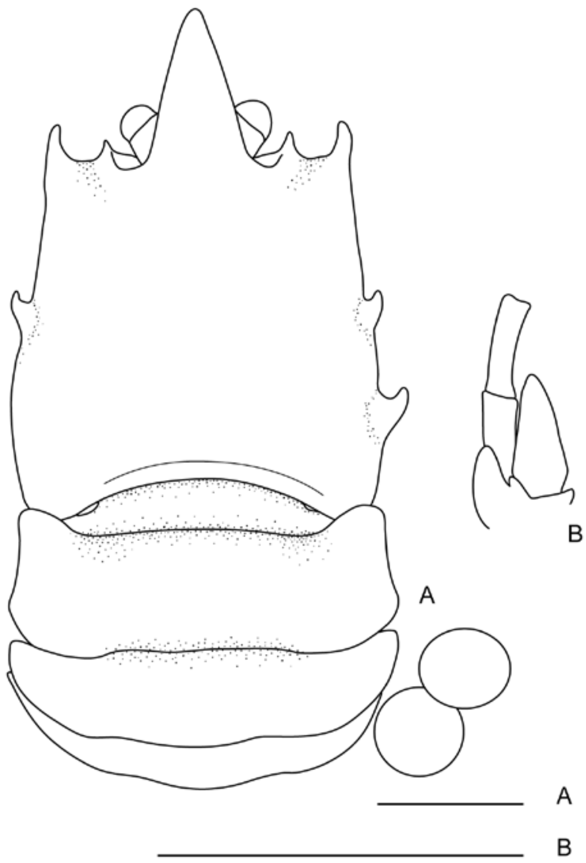


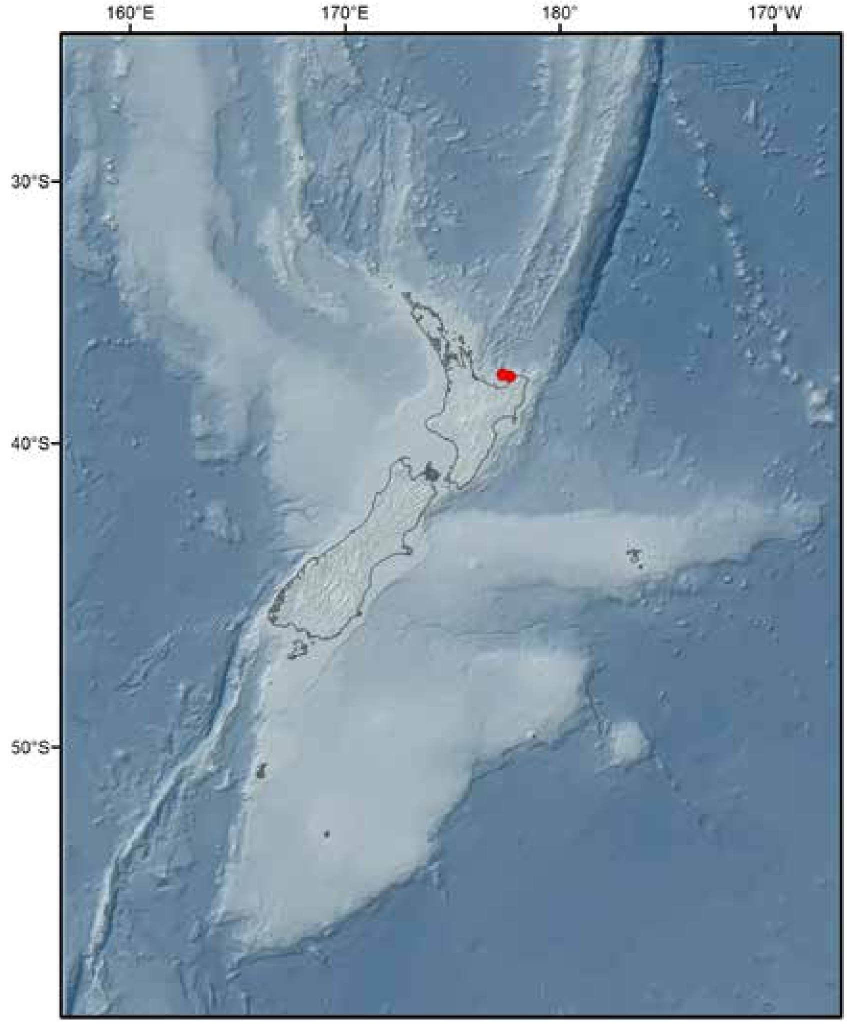
Figure 34. *Uroptychus anomalus* **sp. nov.**, paratype, female ov., NMNZ CR.025210: **A.** carapace, abdomen and two eggs, dorsal; **B.** antenna, ventral, left. Scale bars = 2 mm.

Cheliped: Slender; 4.0 × pcl; surface sparsely setose. Ischium with small dorsodistal spine. Merus and carpus smooth and unarmed. Carpus 1.1 × as long as palm. Palm 4.8 × as long as wide. Length of dactylus 0.5 × as long as propodus; occlusal margins smooth, without gape.

Pereopods 2–4: Similar (all legs detached in examined specimens); surface slightly setose and smooth. Merus unarmed dorsally and ventrally; length 1.0–0.8 × that of propodus (appendage with shortest merus has longest propodus); the shortest merus 0.9 × as long as longest merus. Carpus unarmed. Propodus 5.5–6.0 × longer than wide; extensor margin smooth; flexor margin without spines, distally unarmed, not inflated; 1.7 × as long as dactylus. Dactylus nearly straight; flexor margin with dense fringe of setae covering 8 or 9 sharp triangular spines along distal ¾ portion, arranged perpendicularly and not contiguous; ultimate spine distinctly smaller than penultimate spine; penultimate slightly larger than antepenultimate spines.

Ovum. Holotype with 10 late-stage eggs of 1.2 mm diameter; paratype with 20 eggs of 0.8–1.0 mm diameter.

Figure 35. Distribution of *Uroptychus anomalus* **sp. nov.** around New Zealand.



Colour in life. Unknown.

Etymology. Named *anomalus*, Latin for 'uneven' or 'irregular'; referring to the variation in spines along the lateral margin of the carapace, ranging from 0 to 2.

Remarks. The two specimens were collected six nautical miles apart in 1962 and 1963 and no additional material has been collected since. They are poorly preserved; only one right cheliped is retained and all the pereopods are detached. Both are ovigerous females of similar size (pcl 4.0–4.2 mm) sharing most diagnostic features, but they differ in two characters. The lateral carapace armature is typically diagnostic, but the female holotype has entirely smooth lateral carapace margins, while the paratype has one spine at the midlength of the left branchial margin, and two spines on the right (Figs 33A, 34A, respectively). The overall shape of the carapace is the same, appearing nearly rectangular in dorsal view. Only the right antenna remains for the holotype and it differs in shape from the paratype antenna. Article 2 is laterally rounded and unarmed in the holotype, but angular in the paratype; the antennal scale is short and round, barely reaching the end of the article 4 of the peduncle in the holotype but distally narrowed and overreaching article 4 in the paratype (Figs 33E, 34B). Both specimens, however, share the unique, squared anterior carapace, furnished with a strong anterolateral spines having tufts of setae, thoracic sternite 3 medially V-shaped and with a rounded anterior margin, the lack of spines along the propodi of P2–4 and the row of 8 or 9 sharp perpendicular spines along the dactyli of P2–4.

The combination of the V-shaped margin on sternite 3 and no spines along the flexor margin of propodi and fewer than 8 or 9 spines along the dactyli of P2–4 aligns this species with *U. foulisi* Kensley, 1977 from South Africa. However, the carapace shape of *U. foulisi* differs, with strongly convex lateral margins (nearly parallel in *U. anomalus* **sp. nov.**), and the cheliped bears spines and granules on merus and carpus, with the carpus slightly shorter than the palm in *U. foulisi* (entirely smooth and the carpus longer than the palm in *U. anomalus* **sp. nov.**). The ultimate spine on the P2–4 dactyli also differs with the ultimate spine subequal in width to the penultimate in *U. foulisi* and smaller in *U. anomalus* **sp. nov.**

Uroptychus anomalus **sp. nov.** is also similar to *U. longvae* Ahyong & Poore, 2004, also from New Zealand, and *U. patulus* Ahyong & Poore, 2004 from Australia, which also lack spines on the P2–4 propodi. However, the lateral carapace margin is distincly convex and the

P2–4 dactyli bear rows of ≥ 20 small triangular spines in both these species (sub-parallel lateral carapace margin and only 8 or 9 sharp, perpendicular spines in *U. anomalus* **sp. nov.**).

ZooBank registration. *Uroptychus anomalus* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:3A5D54E7-6624-424E-9ECE-BA462028AF28.

Uroptychus aotearoa sp. nov. Figs 36–38

Material examined. Holotype NMNZ CR.022702, NORFANZ Stn TAN0308/89, 34°12.18′S, 162°41.18′E, Lord Howe Plateau, Australian EEZ, 748–772 m, 26 May 2003, 1 male (10.2 mm, pcl 7.3 mm). **Paratypes** *Lord Howe Plateau*: NMNZ CR.022703, same locality as holotype, 1 female ov. (13.0 mm, pcl 9.8 mm; sequenced, see Fig. 5). *Whakatane Seamount, Southern Kermadec Ridge*: NIWA 82719, NIWA Stn TAN1206/78, 36°49.25–49.34′S, 177°27.62–27.54′E, 900–907 m, 22 Apr 2012, 1 female (12.2 mm, pcl 8.5 mm; sequenced, see Fig. 5), 1 male (rostrum truncated, pcl 11.4 mm; sequenced, see Fig. 5); NIWA 82812, NIWA Stn TAN1206/88, 36°48.08–47.88′S, 177°27.25–27.35′E, 972–950 m, 23 Apr 2012, 1 female ov. (rostrum truncated, pcl 8.5 mm), 1 male (11.0 mm, pcl 8.0 mm).

Other material. *Reinga Ridge*: NMNZ CR.025211, NZOI Stn E855, 33°10.00′S, 169°56.00′E, 742–716 m, 17 Mar 1968, 1 male (5.9 mm, pcl 4.1 mm).

Type locality. Lord Howe Plateau, 748–772 m.

Distribution. Lord Howe Rise, Reinga Ridge and southern Kermadec Ridge, 748–972 m (Fig. 38).

Habitat. Unknown.

Diagnosis. Carapace surface unarmed, smooth, nearly as long as broad; lateral margin unarmed, smooth or slightly irregular along lateral gastric and cardiac margins; posterolateral corner without ridge. Anterolateral spine well-developed, over-reaching lateral orbital angle. Rostrum basal width about half distance measured between carapace anterolateral spines. Pterygostomian flap surface smooth, anteriorly produced to spine. Excavated sternum produced anteriorly. Sternite 3 deeply excavated, with median notch flanked by submedian spines. Sternite 4 with transverse row of large tubercles and some scattered granules on surface, indistict in some smaller specimens; anterolateral margin irregular, anteriorly not reaching end of sternite 3, distinctly longer than posterolateral margin. Sternite 5 with distinctly convex anterolateral margin. Ocular peduncle stout (1.6–1.8 × longer than broad); concave mesial margin. Antennal article 2 with well-developed distolateral spine; antennal scale nearly reaching but not overreaching distal end of peduncle; article 5 2.6–2.8 × longer than article 4. Cheliped length 5–6 × pcl; ischium irregular but unarmed at ventromesial margin; palm without sharply ridged mesial margin. P2–4 meri subequal in width, P4 merus 0.8 × length of P2–3 meri. P2–4 carpi longer than dactyli; P4 carpus shorter than P3 carpus. P2–4 propodi with pair of terminal spines preceded by 5–12 spines along flexor margin; P2 propodus with 9–12 spines along about distal 3/4 of propodal flexor margin. P2–4 dactyli slightly more than one-third length of propodi, not truncate distally, with row of regularly arranged, obliquely directed spines along flexor margin; ultimate subequal in size to both penultimate and antepenultimate spines.

Description. Carapace: pcl 1.0–1.1 × width, strongly convex from side to side. Dorsal surface smooth other than tiny tubercles in epigastric and hepatic regions; cervical groove indistinct. Lateral orbital spine small. Anterolateral margin spine well-developed, larger than and overreaching lateral orbital spine, directed straight forward; lateral margins convexly divergent posteriorly, greatest breadth of carapace measured at posterior third, with row of short, oblique, granulate ridges along branchial region, otherwise unarmed; posterolateral corner rounded, without distinct ridge. Rostrum breadth about half distance between anterolateral spines; 0.3–0.4 × length of remaining carapace, spiniform, horizontal; 1.1 × longer than wide at base; dorsal surface smooth, glabrous; lateral margins smooth. Pterygostomian flap lateral surface smooth other than a few tiny tubercles on anterior portion; anterior margin produced into distinct spine.

Thoracic sternum: Excavated sternum anteriorly produced and with small granule at midline. Sternal plastron 1.2 × as wide as long, widening posteriorly, surface smooth. Sternite 3 anterolaterally rounded, laterally with stout spine; furnished with 1 or 2 granules; median notch present with submedian spines. Sternite 4 2.2 × as wide as sternite 3, surface with transverse row of large tubercles and a few scattered small granules (indistinct in small specimens); anteriorly deeply concave; anterolateral margin produced to tooth, not overreaching sternite 3, followed by regular row of proximally diminishing spines along entire margin; anterolateral margin distinctly longer than posterolateral margin.

Abdomen: Tergites smooth and unarmed. Telson 2 × as broad as long; posterior margin emarginated; posterior portion 1.5 × length of anterior portion.

Eyes: Smooth and unarmed, mesial margin

Figure 36. Live coloration of *Uroptychus aotearoa* **sp. nov.**, NMNZ CR.022702 (holotype) and NMNZ CR.022703 (paratype), NORFANZ Stn TAN0308/89.

with distinct concavity proximal to cornea. Cornea subglobular, 0.5 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine, otherwise unarmed. Article 5 2.6–3.0 × as long as article 4. Antennal scale nearly reaching end of article 5; 4.1–4.3 × as long as wide.

Maxilliped 3: Smooth and unarmed. Basis and ischium with about 10 distinct denticles on crista dentata followed by distally diminishing row of tubercles.

Cheliped: Elongate; 4.5–5.7 × as long as carapace (3.2–3.8 × cl); surface moderately setose. Ischium with dorsal distal spine and with irregular row of tubercles on ventral margin (without subterminal spine). Merus with with scattered spines mesially and ventrally and tubercles in longitudinal row, and blunt low distal spine mesially and laterally. Carpus with field of tubercles on distomesial surface; unarmed distally; length 1.1–1.2 × that of palm. Palm 2.6–2.9 × as long as broad, unarmed. Dactylus length about 0.6 × as long as propodus; occlusal margins denticulate, with slight gape.

Pereopods 2–4: Surface sparsely covered with long setae. Meri unarmed, all subequal in width; P4 merus 0.75 × as long as P2 merus; 0.9–1.0 × as long as propodus. Carpus unarmed; 0.5–0.6 × length of propodus. Propodus 4.9–5.2 × longer than wide, slightly widening distally; extensor margin smooth; flexor margin with 5–10 spines along 0.5–0.7 portion in addition to distal pair of spines; 1.9–2.4 × as long as dactylus. Dactylus curved; flexor margin with 10–13 spines along entire length, all loosely arranged, sharp triangular and slightly inclined; distal 3 spines subequal in size.

Colour in life. Base colour peach, carapace with darker red-purple band across gastric region, ocular peduncle and rostrum pale. Pereopods darker orange (Fig. 36).

Etymology. Named *aotearoa*, the Māori name for New Zealand, to signify the distinction of this species from the Australian congener *U. bardi*; noun in apposition.

Remarks. Specimens were initially identified as *Uroptychus bardi* McCallum & Poore, 2013 from Western Australia which was, subsequently, also reported and illustrated by Baba (2018) from Wallis and Futuna Islands and Vanuatu. However, high levels of CO1 sequences divergence (see below), and slight but consistent morphological differences justify formally naming the New Zealand material as the new species, *U. aotearoa* **sp. nov.** Comparisons are slightly challenging since the specimens examined here are mostly smaller than published records, which could affect the proportions and ornamentation, particularly since the main diagnostic differences between *U. bardi* and the other similar species, *U. litosus* Ahyong & Poore, 2004, are in the presence or absence of granules scattered around thoracic sternite

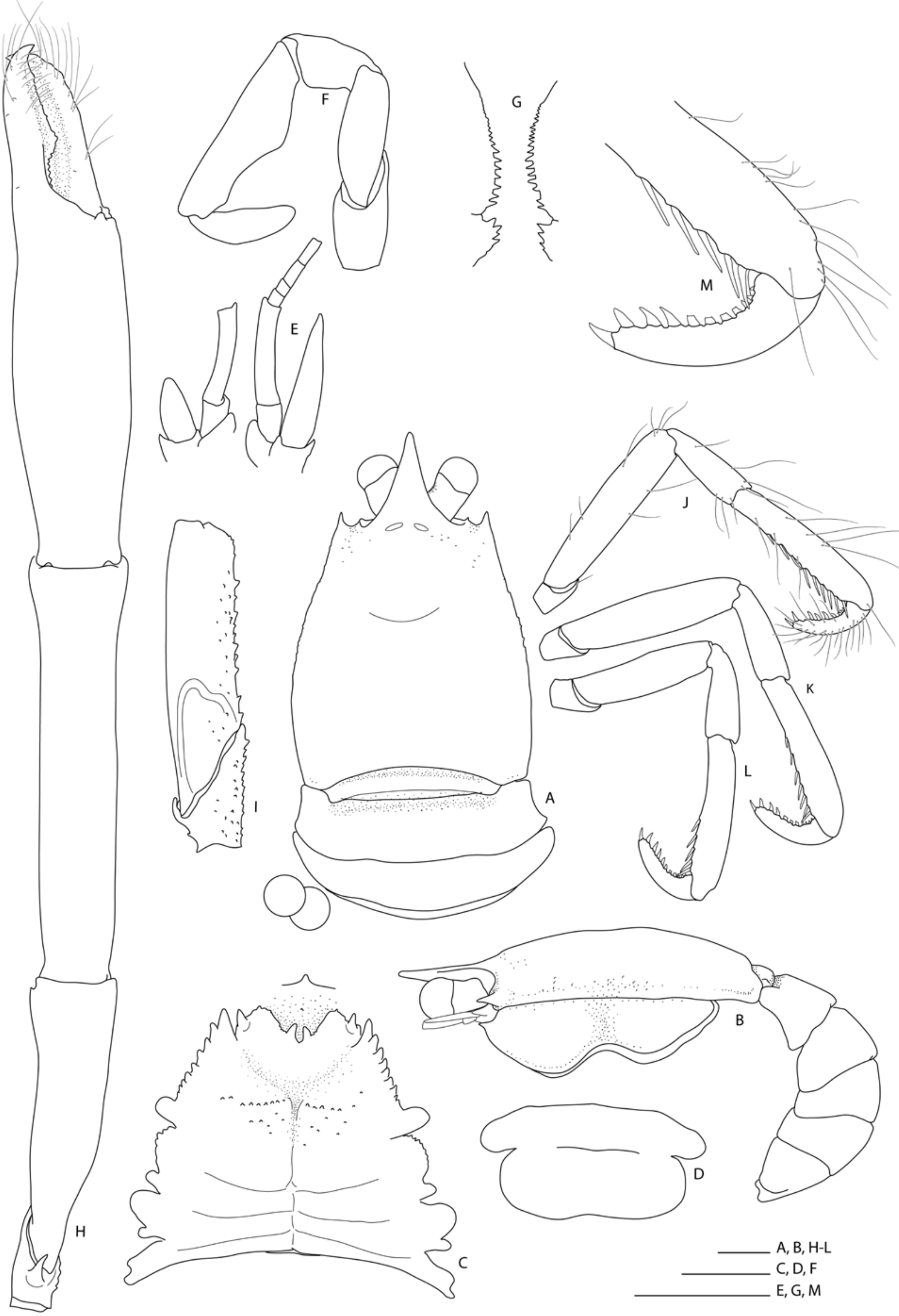


Figure 37. *Uroptychus aotearoa* **sp. nov.**, holotype female ov., NMNZ CR.022702: **A.** carapace and abdomen dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left; **G.** crista dentata of Mxp3, left and right, lateral; **H.** left cheliped, dorsal; **I.** left cheliped, ischium and merus, mesial; **J–L.** right pereopods 2–4; **M.** dactylus and distal portion of propodus of right P4, lateral. Scale bars = 2 mm.

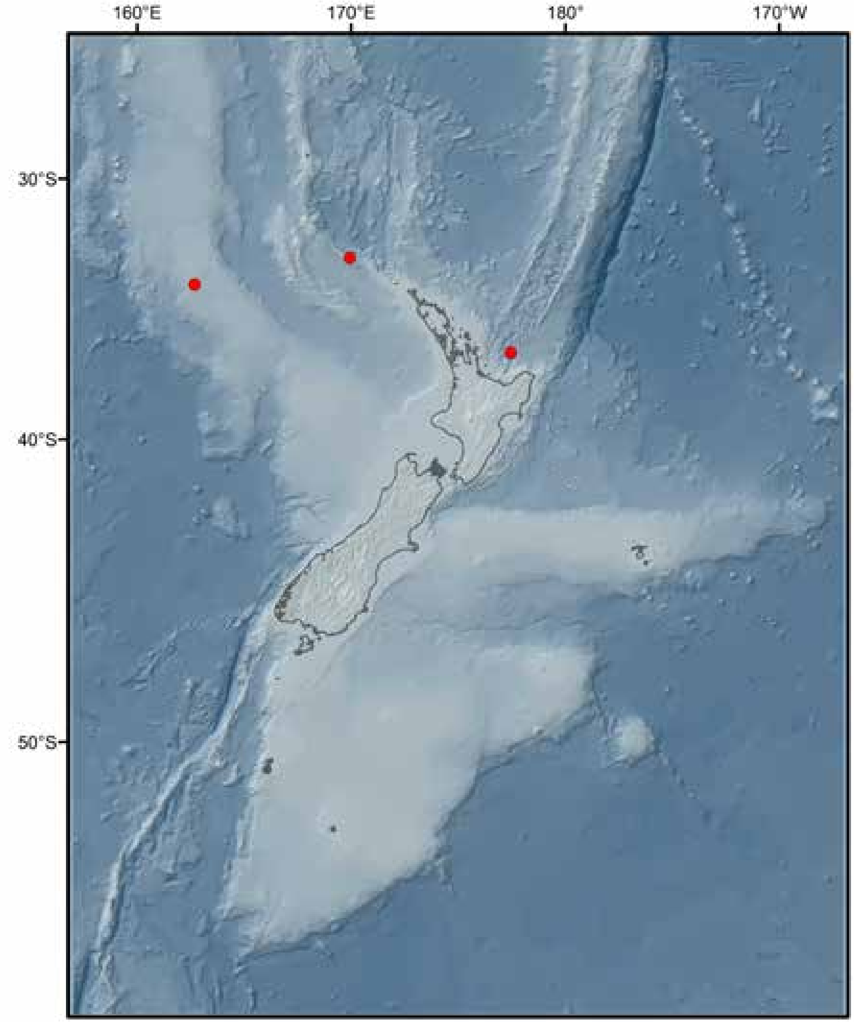


Figure 38. Distribution of *Uroptychus aotearoa* **sp. nov.** around New Zealand.

3. *Uroptychus aotearoa* **sp. nov.** shares the distinct row of granules across sternite 4 (Fig. 37C) with *U. bardi* and the larger specimens also have a few small granules scattered across the surface, but these are indistinct in the small specimens. *Uroptychus litosus* has only one row of small granules across the surface of sternite 4, being otherwise smooth.

Characters to distinguish *U. bardi, U. litosus*, and *U. aotearoa* **sp. nov.** are limited. Baba (2018) added the shape of the anterior end of the excavated sternum, a rounded margin in *U. bardi*, angular as in *U. litosus*, and the specimens examined here share the angular anterior margin of the excavated sternum.

Type material for both *U. bardi* and *U. litosus* have been checked and the following characters have been confirmed (A. McCallum, Museums Victoria, pers. com.):

- *U. bardi* and *U. aotearoa* **sp. nov.** lack a distinct ridge on the posterolateral corner of the carapace, while *U. litosus* has a distinct ridge present (even in the smallest specimens examined among New Zealand material);
- the length ratio between the antennal articles 4 and 5 differs slightly with the article 5 2.6–2.8 × longer than article 4 in *U. bardi*, 2.7–3.0 in *U. aotearoa* **sp. nov.** and 1.8–2.3 × in *U. litosus*;
- the cheliped length appears to differ: cheliped length for *U. aotearoa* **sp. nov.** (4.9–5.7 × pcl for all larger specimens and 4.3 × pcl in the single smallest specimen) overlaps with that of *U. bardi* (5.1–5.8 × pcl) and is shortest in *U. litosus* (3.8–4.8 × pcl);
- the P4 merus is as broad as the P2–3 meri in both *U. bardi* and *U. aotearoa* **sp. nov.**, instead of narrower than the P3 merus (*U. litosus*);
- in larger specimens of both *U. bardi* and *U. aotearoa* **sp. nov.**, the P2 propodus bears spines along the distal 0.7–0.9 portion of the flexor margin, while *U. litosus* has spines along the distal ~0.5 portion only. However, for the single smallest specimens of *U. aotearoa* **sp. nov.**, only the distal 0.5 of the P2 bears spines, so this character overlaps depending on the size of the specimen.

Baba (2018) also proposed a difference in the number of spines along the P2–4 propodal flexor margin (in addition to the distal pair) with 7 or 8 in *U. litosus* and 10–12 in *U. bardi*. The number ranges from 5 to 10 in *U. aotearoa* **sp. nov.** (from 6 to 10 when only considering P2) but it is likely that this range overlaps between species with the P2 of the holotype of

U. litosus having 10 spines and the holotype of *U. bardi* nine spines on P2–3.

The other New Zealand species that *U. aotearoa* **sp. nov.** closely resembles is *U. empheres* Ahyong & Poore, 2004. Distinguishing characters include a prominent anterolateral spine that clearly overreaches the lateral orbital spine in *U. aotearoa* **sp. nov.**, while *U. empheres* has a small anterolateral spine that does not extend beyond the lateral orbital spine. In *U. empheres* the P2–3 meri are more distinctly unequal in length with P4 merus shorter, about 0.6 × the length of P3 merus (0.8 × in *U. aotearoa* **sp. nov.**); *U. empheres* has a nearly rounded anterior margin of the pterygostomian flap, bearing only a tiny spine, while *U. aotearoa* **sp. nov.** bears a strong anterior spine.

DNA sequence data. Intraspecific sequence divergence for partial CO1 gene: 0.3–2.4% (four specimens). Interspecific sequence divergence: 8.0–13.4% (*U. bardi* collected off NW Australia (NMV J59083).

ZooBank registration. *Uroptychus aotearoa* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:0B2CB4A5-CF5D-427D-BBE6-33CFA3AE8FBE.

Uroptychus australis (Henderson, 1885)

Figs 39–41

Diptychus australis Henderson, 1885: 420 (part; not specimens from north of the Kermadec Islands: *U. terminalis* Baba, 2018).

Uroptychus australis, Henderson, 1888: 179 (part), pl. 21: figs 4, 4a–4c; Ahyong & Poore 2004: 18, fig. 3; Poore 2004: 224, fig. 60 (compilation); Baba 2005: 224 (designation of lectotype: male, NHMUK 1888:33, H.M.S. *Challenger* Stn 164); Poore *et al.* 2008: 17 (unnumbered photo); Schnabel 2009a: 551, fig. 5 (part); Schnabel 2009b: 26 (list); Rowden *et al.* 2010: 75 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 207 (list); Baba 2018: 74, figs 20–23.

Uroptychus vandamae Baba, 1988: 49, 52 (part; paratype, USNM 150317, from Albatross Stn 5664).

Material examined. *West Norfolk Ridge (International Waters)*: NIWA 106425, NIWA Stn TAN1312/D27-d37, 33°18.58′S, 166°39.88′E, 1610–1340 m, 09 Nov 2013, 1 female (8.5 mm, pcl 5.9 mm), 1 male (12.1 mm, pcl 8.6 mm), on chrysogorgiid.

South of Three Kings Islands: NMNZ CR.015253, Stn J06/57/81, 34°52.1′S, 172°2.7′E, 876–894 m, 24 Apr 1981, 1 female ov. (10.2 mm, pcl 7.4 mm).

Kermadec Islands: NMNZ CR.023695, Stn BS312, Raoul Island, 28°25′S, 177°50′E, 1189–1225 m, 5 Apr 1973, 3 males (6.4, 5.1 mm, pcl 4.4, 3.3 mm and 1 broken carapace), with branches of gold coral; AKM MA124688 (ex NIWA 115195), Kermadec-Rangitahua Stn TAN1612/79, Macauley Island, 30°15.53–15.80′S, 178°14.88–15.06′W, 982–978 m, 29 Oct 2016, 3 males (5.9, 6.6, 7.9 mm, pcl 4.1, 4.5, 5.3 mm; smallest and largest sequenced, see Fig. 5).

Kermadec Ridge: NIWA 85971, NIRVANA Stn TAN1213/16, 31°6.09–6.15′S, 178°36.88–37.22′W, 834–825 m, 16 Oct 2012, 1 female (6.5 mm, pcl 4.8 mm; sequenced, see Fig. 5); NIWA 115199, NIRVANA Stn TAN1213/39, 31°06.25–06.11′S, 179°05.97–05.97′W, Havre volcano western flank, 1022–1034 m, 20 Oct 2012, 1 female (carapace broken, cl ~8.5 mm); NIWA 82882, NIWA Stn TAN1206/97, 36°27.27–27.11′S, 177°50.26–50.19′E, Clark Seamount, 920–950 m, 24 Apr 2012, 1 male (10.0 mm, pcl 7.2 mm), 1 female (10.3 mm, pcl 7.1 mm).

Bay of Plenty: NMNZ CR.015263, NZOI Stn R120, 37°29.00–30.6′S, 177°32.00–32.4′E, 818–898 m, 24 Apr 1979, 1 female ov. (9.8 mm, pcl 7.1 mm), 2 males (9.3, 8.9 mm, pcl 6.7, 6.0 mm), on *Acanella* coral; NIWA 83166, NIWA Stn TAN1206/145, 37°31.47–31.70′S, 177°18.24–18.11′E, White Island Canyon, 918–1003 m, 28 Apr 2012, 1 male (9.8 mm, pcl 6.9 mm); NIWA 9007, NIWA Stn TAN0413/59, 37°12.55–12.96′S, 177°14.26–14.21′E, 910–701 m, 11 Nov 2004, 1 male (rostrum bent, pcl 6.8 mm, 1 anterior quarter of a specimen only; complete specimen sequenced, see Fig. 5).

Matatara Knoll, Bay of Plenty: NIWA 24577, NIWA Stn TAN1206/164, 37°10.83–10.84′S, 176°58.96–58.79′E, 1000–998 m, 30 Apr 2012, 1 female (10.1 mm, pcl 7.3 mm); NIWA 85199, NIWA Stn TAN1206/166, 37°11.02–11.01′S, 176°59.02–58.83′E, 928 m, 30 Apr 2012, 1 male (9.1 mm, pcl 6.0 mm), 1 female (7.8 mm, pcl 5.8 mm); NIWA 83369, NIWA Stn TAN1206/168, 37°11.22–11.20′S, 176°58.70–58.48′E, 948–930 m, 30 Apr 2012, 1 male (damaged, pcl 6.1 mm), 1 female (9.7 mm, pcl 7.0 mm).

Southern Colville Ridge: NIWA 88553, NIWA Stn KAH9907/51, 36°30.37–29.59′S, 176°30.97–30.97′E, 920–1053 m, 05 Jun 1999, 1 male (9.2 mm, pcl 6.6 mm), 1 female (8.3 mm, pcl 5.7 mm);

Hikurangi Margin: NIWA 76717, NIWA Stn TAN1003/24, 40°05.43′S, 178°11.35′E, Ritchie Hill, 744 m, 22 Mar 2010, 1 female ov. (9.4 mm, pcl 7.1 mm; sequenced, see Fig. 5).

Type & locality. Lectotype—NHMUK 1888:33, H.M.S. *Challenger* Stn 164, 34°13′ S, 151°38′ E, off Port Jackson, Australia, 750 m, male (pcl 4.4 mm).

Distribution. Southern Australia (Western Australia, New South Wales, Victoria, and Tasmania), Indonesia (Makassar Strait, off Banda), Solomon Islands, Wallis and Futuna Islands, Vanuatu, Tonga, Loyalty Islands, New Caledonia, Kiribati, Hunter-Matthew Islands, Norfolk Ridge, Lord Howe Rise;

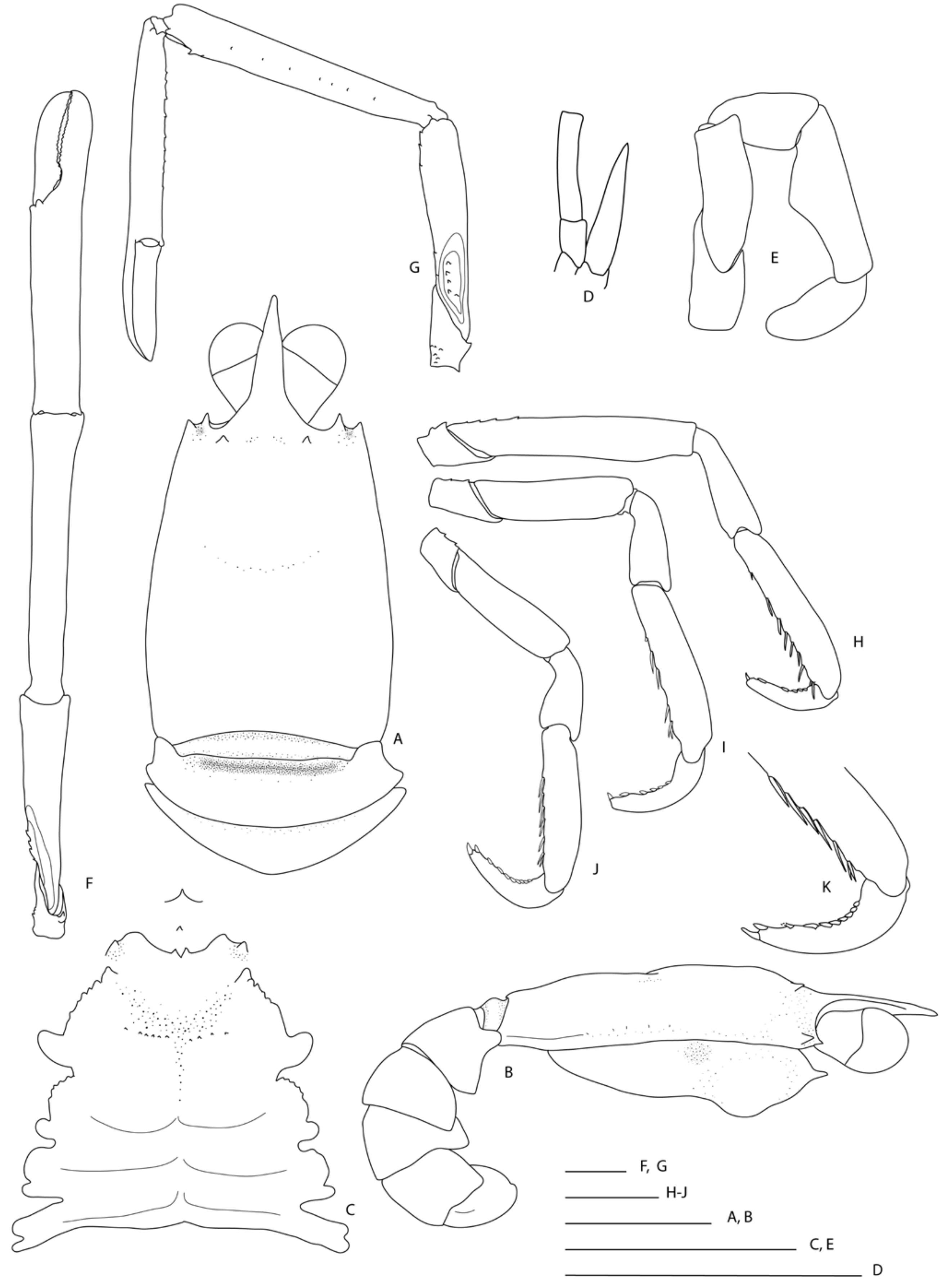


Figure 39. *Uroptychus australis* Henderson, 1885 lectotype, male, NHMUK 1888:33: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** antenna, left, ventral; **E.** endopod of Mxp3, right; **F.** right cheliped, dorsal; **G.** right cheliped, mesial; **H–J.** right P2–4; **K.** dactylus and distal portion of propodus of right P4, lateral. Scale bars = 2 mm.

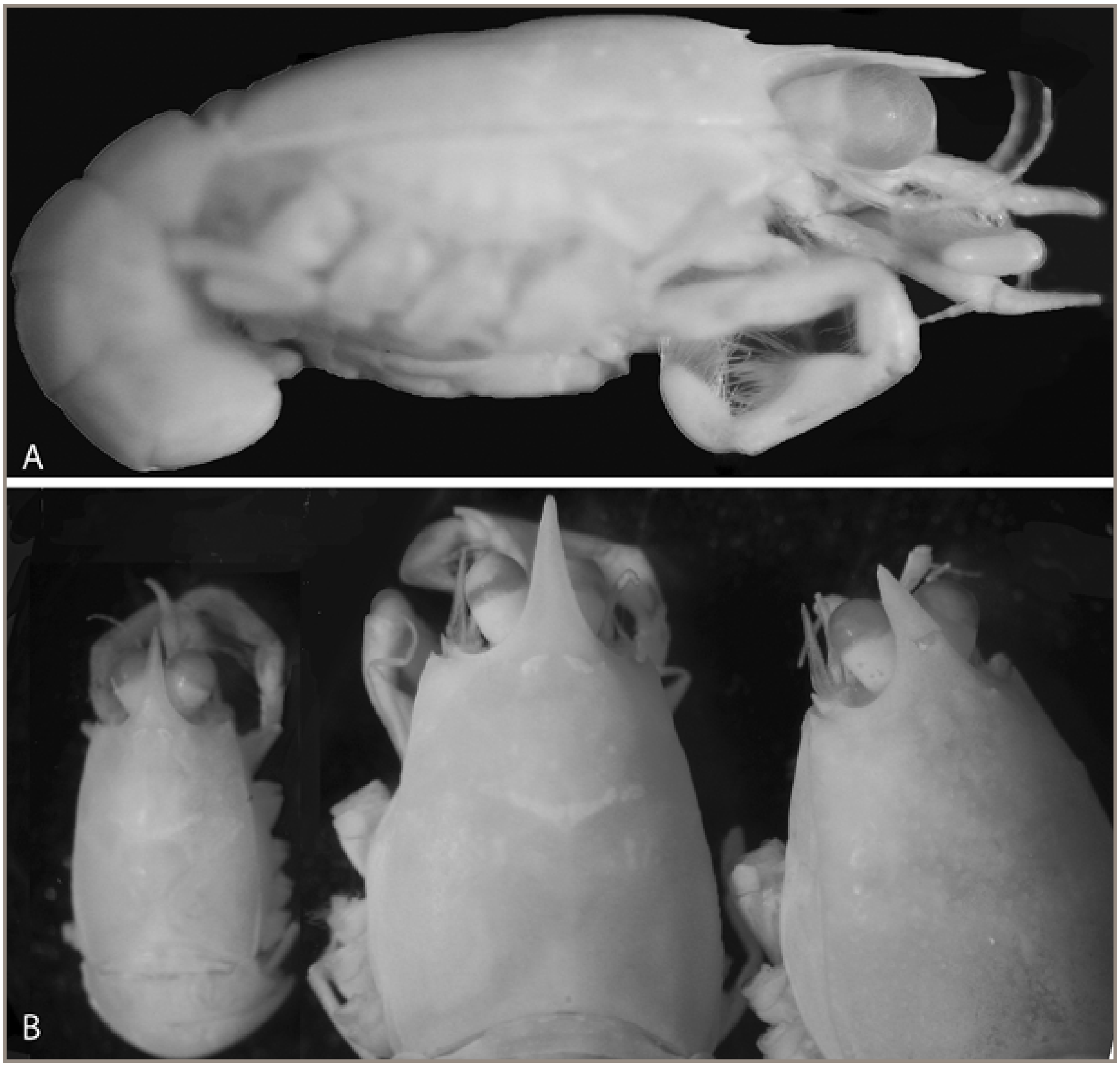


Figure 40. *Uroptychus australis* Henderson, 1885, NHMUK 1888:33: **A.** 1 male (pcl 4.4 mm), lectotype, off Port Jackson, Challenger Stn 164, lateral habitus; **B.** (from left to right) male lectotype, female paralectotypes (7.5, 7.2 mm), dorsal habitus. Note epigastric spines and granules.

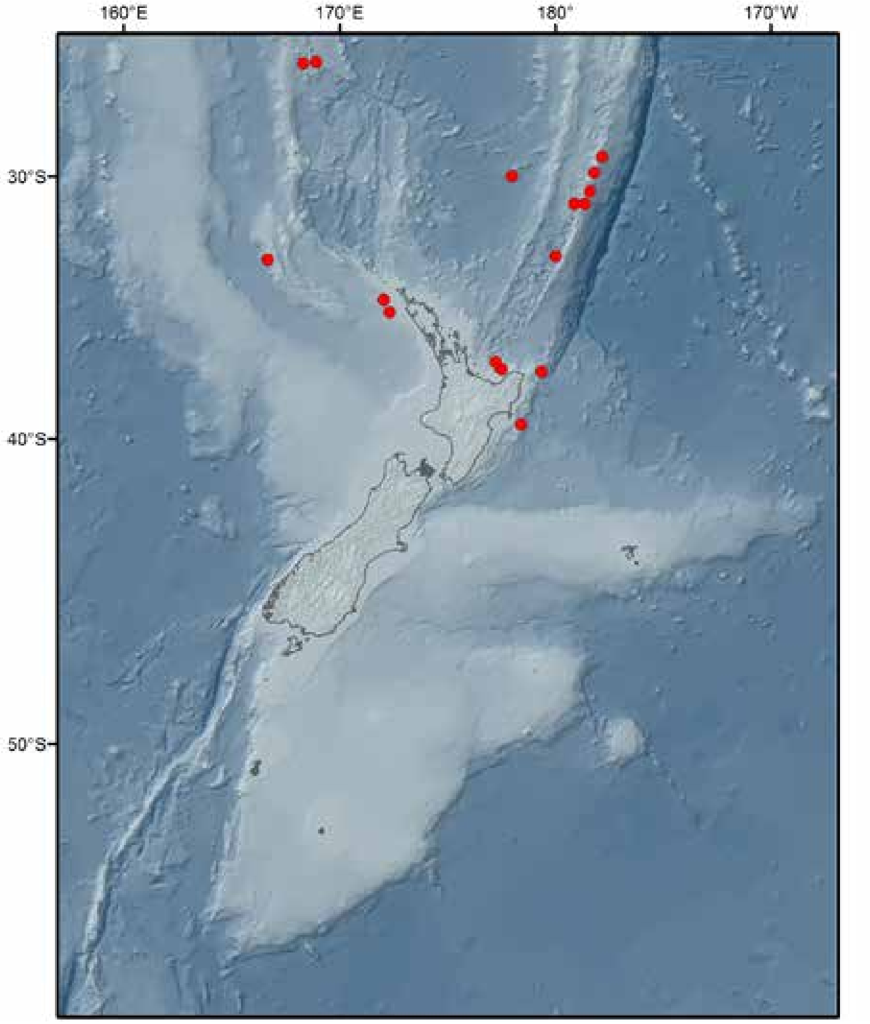
331–1218 m. Records added here for Norfolk Ridge, Kermadec Ridge, Bay of Plenty, and Hikurangi Margin, 744–1610 m (Fig. 41).

Habitat. Two samples of *U. australis* were picked off gorgonian corals, e.g. (NIWA 106425, NMNZ CR.012079), a total of 13 specimens from lot (NMNZ CR.012080, Schnabel (2009a)) were preserved with pieces of an unidentified *Chrysogorgia* gold coral indicating a possible association. Three specimens were picked off a large *Acanella* bamboo coral which it shared with *U. terminalis* and an unidentified axiid shrimp (NMNZ CR.015263). A female from the Kermadec Ridge (NIWA 85971) bears a bopyrid.

Diagnosis. Carapace excluding rostrum distinctly longer than broad; lateral margins unarmed, convexly divergent, distinctly or indistinctly ridged along posterior third or quarter; dorsum unarmed or with pair of obsolescent to small epigastric tubercles; lateral orbital spine distinct, situated slightly anterior to distinct anterolateral spine. Rostrum narrow triangular. Excavated sternum with distinct granule at midlength. Sternite 3 deeply emarginated, with pair of median spines. Antennal article 2 with distinct outer spine; articles 4 and 5 unarmed; antennal scale barely reaching to slightly overreaching end of peduncle, tapering distally. Cheliped merus with at least one row of large tubercles on mesial proximal margin; ischium with stout triangular distodorsal spine, ventromesially unarmed; palm long, 3–4 × as long as wide. P2–4 meri with proximal dorsal ridge irregular; propodus flexor margin with terminal spines paired, close to juncture with dactylus, closely followed by row of spines; dactyli distally tapering; flexor margin with row of spines orientated parallel to margin, penultimate spine close to ultimate, antepenultimate spine located slightly separate from penultimate as well as distal fourth; P4 merus short, about half length of P3 merus.

Colour in life. A Western Australian specimen

Figure 41. Distribution of *Uroptychus australis* Henderson, 1885 around New Zealand.



illustrated by Poore *et al.* (2008: 17) has a pale pink body with the anterior portion of the carapace a darker hue of pink and purple.

Remarks. Baba (2005) designated the lectotype from among the widely distributed type material of *U. australis* collected by the H.M.S. *Challenger* expedition, which contained three species. More recently, Baba (2018) re-illustrated the male lectotype and two female paralectotypes from off Port Jackson, Sydney (H.M.S. *Challenger* Stn 164), assigned two of the three specimens from H.M.S. *Challenger* Stn 194 from Banda, Indonesia, to *U. australis* (the large ovigerous female was referred to *U. empheres* Ahyong & Poore, 2004), and the material collected off the Kermadec Islands (H.M.S. *Challenger* Stns 170, 171) were referred to *U. terminalis* Baba, 2018. At the same time, the ovigerous female paratype of *U. vandamae* Baba, 1988 from Makassar Strait, was referred to *U. australis* and new material from the wider southwestern Pacific (from the Solomon Islands to Tonga, Lord Howe, and Norfolk Ridge) was presented. Two stations (NORFOLK 2 DW2066 and DW2080) lie just within the New Zealand region and are included in Fig. 41. Ahyong & Poore (2004) reported *U. australis* as 'the most common species of the genus off eastern Australia' with records from northern New South Wales to Tasmania. Subsequently, Poore *et al.* (2008) reported four specimens from Western Australia (with latitudes ranging from 22–35°S). This as currently understood is a widespread Indo-West Pacific species and its diagnostic characters are the smooth carapace (a small pair of epigastric spines or granules is typically present; Fig. 40 illustrates the lectotype and paralectotypes) and the armature of the walking legs. Specifically, the spines along the flexor margin of the P2–4 dactyli are contiguous (parallel) with the margin and the distal-most spines along the propodi are paired. In all other characters, this species overlaps with *U. terminalis*, including the proportions and length of appendages, antennal and sternal characters.

Schnabel (2009a) provided records of *U. australis* from New Zealand. However, some of the specimens listed are here referred to *U. nigricapillis* and *U. terminalis* (see below under those species). Comments on variation included the size of the epigastric spine, the antennal scale and the prominence of the granulation on the mesial margin of the cheliped merus. This variation covers that observed in the additional material of *U. australis* presented here.

The parallel spines on the P2–4 dactyli is a rare feature that only a few species in this genus share. Most similar is *U. setosipes* Baba, 1981 from Japan, but, according to Baba (2018), it differs clearly by the absence of a sharp ridge along the entire lateral carapace margin (in *U. australis* only the posterior quarter to one-third bears a slight ridge) and the antennal article 2 bears a small instead of a distinct distolateral spine in *U. australis*. *Uroptychus brevirostris* from the Philippines and Indonesia also shares the spination of the walking legs but the carapace is as long as broad, whereas it is longer than broad in *U. australis*; the anterolateral spine of the carapace (in dorsal view) is closer to the lateral orbital spine in *U. brevirostris* than in *U. australis*, the cheliped is more massive in *U. brevirostris*, with the palm short relative to breadth (length 2.3 × breadth in *U. brevirostris* compared to more than 3 × in *U. australis*), and the P4 merus is 0.7–0.8 × the length of P3 merus in *U. brevirostris* instead of at most 0.6 in *U. australis*.

In New Zealand, the only species that share the parallel spines on the dactyli are *U. bispinatus*, *U. brevisquamatus* and *U. webberi*. Differences are discussed under those species below.

Uroptychus australis closely resembles *U. gracilimanus* (Henderson, 1885), *U. vandamae* Baba, 1988, *U. empheres* Ahyong & Poore, 2004, *U. remotispinatus* Baba & Tirmizi, 1979, *U. nigricapillis* Alcock, 1901 and *U. terminalis* Baba, 2018, of which the last four also occur in New Zealand. The combination, however, of an antennal scale nearly reaching or overreaching the peduncle, a very short and narrow P4 merus compared to the P2/P3 meri (P4 merus ~0.6 × width and 0.5–0.6 × length of P3 merus), the distal spine of P2–4 meri propodi paired and the spines on the flexor margin of the P2–4 oriented parallel to, instead of oblique to the dactylar margin readily distinguishes *U. australis* (Fig. 39).

DNA sequence data. Intraspecific sequence divergence for partial CO1 gene: ≤ 0.8% (four specimens). Interspecific sequence divergences: 11.9–12.3% (*U. empheres*, 3 specimens), 12.8% (*U. terminalis*, three specimens).

Uroptychus baeomma Baba, 2018 — Figs 42, 43

Uroptychus baeomma Baba, 2018: 87, figs 28, 29.

Type & locality (not examined). Holotype—MNHN-IU-2014-16310, Biocal Stn DW83, 20°35′S, 166°54′E, Loyalty Islands, 460 m, female ov. (pcl 9.8 mm).

Material examined. *Macauley Island, Kermadec Islands*: NIWA 23360, NZOI Stn T235, 30°19.30′S, 178°21.00′W, 510 m, 23 Mar 1982, 1 female (12.1 mm, pcl 8.3 mm).

Distribution. Vanuatu, New Caledonia, Loyalty Islands, Hunter and Matthew Islands, and now off Macauley Island, Kermadec Ridge, 415–520 m (Fig. 43).

Habitat. Unknown.

Diagnosis. Carapace dorsal surface unarmed and smooth, covered with scattered short setae; lateral margin with 4 or 5 strong branchial and some small to indistinct hepatic spines, other than anterolateral spine. Lateral orbital spine small, overreached by anterolateral spine. Rostrum relatively narrow (breadth < 0.5 × width between base of anterolateral spines), with obsolescent subapical serrations. Sternite 3 depressed, anterior margin shallow concave, with deep U-shaped median notch, flanked by submedian spines. Sternite 4 anterolaterally rounded. Antennal scale slightly overreaching to slightly falling short of distal end of antennal peduncle; article 4 with small spine, article 5 with small to obsolescent spine distally. Cheliped ischium unarmed along ventromesial margin, palm with distinct mesial ridge in large specimens. P2–4 propodi flexor margin with 1–6 spines in addition to distal pair, not inflated; dactyli distally narrowed, longer than carpi, with 8–11 sharp triangular, loosely and regularly arranged spines, penultimate spine subequal in size to antepenultimate, much wider than ultimate.

Colour in life. Not known.

Remarks. Minor differences of the New Zealand *U. baeomma* include: the lateral carapace spines appear larger in the New Zealand specimen than illustrated for the holotype, the antennal scale slightly overreaches the peduncle (the description states that it may reach the end of the peduncle), and the P2–4 meri are ventrodistally less actute than illustrated for the holotype (Fig. 42).

Uroptychus baeomma is aligned with *U. multispinosus* Ahyong & Poore, 2004 in the key to species. Differences between these are discussed under the account of the latter species.

Uroptychus bathamae sp. nov. — Figs 44, 45

Material examined. Holotype NIWA 81213, NIWA Stn KAH9907/48, 37°28.15–28.09′S, 177°06.70–06.57′E, off White Island, 250–310 m, 05 Jun 1999, female ov. (4.7 mm, pcl 3.2 mm). **Paratypes** *Bay of Plenty, Mahina Knoll*: NIWA 9016, NIWA Stn TAN0413/130, 37°21.34–21.29′S, 177°05.98–06.22′E, 260–280 m, 14 Nov 2004, 1 female (4.8 mm, pcl 3.2 mm; sequenced, see Fig. 5). *Bay of Plenty, off White Island*: NIWA 23363, same station as holotype, 1 male (4.1 mm, pcl 2.8 mm), 2 females ov. (5.8, 5.0 mm, pcl

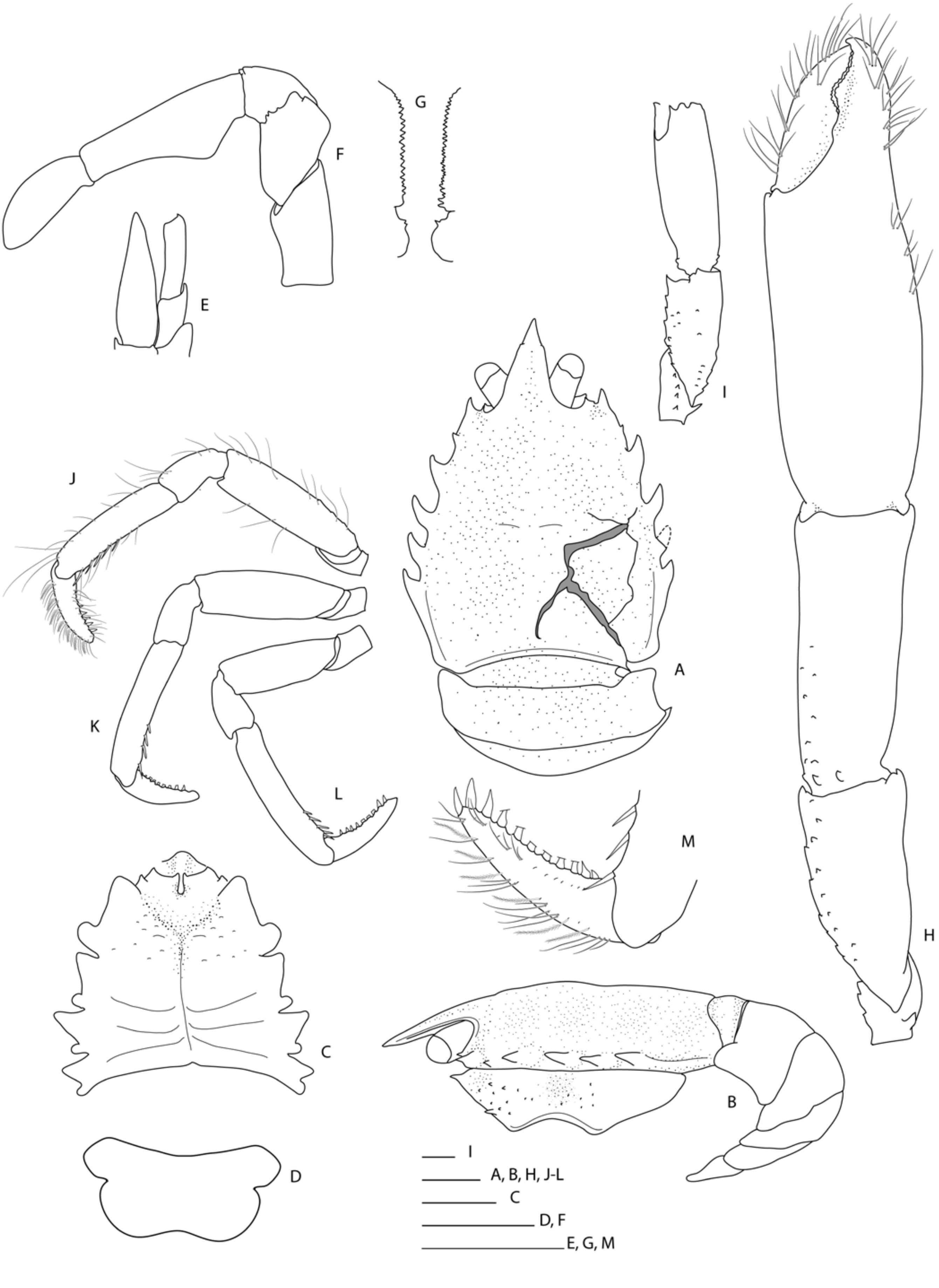
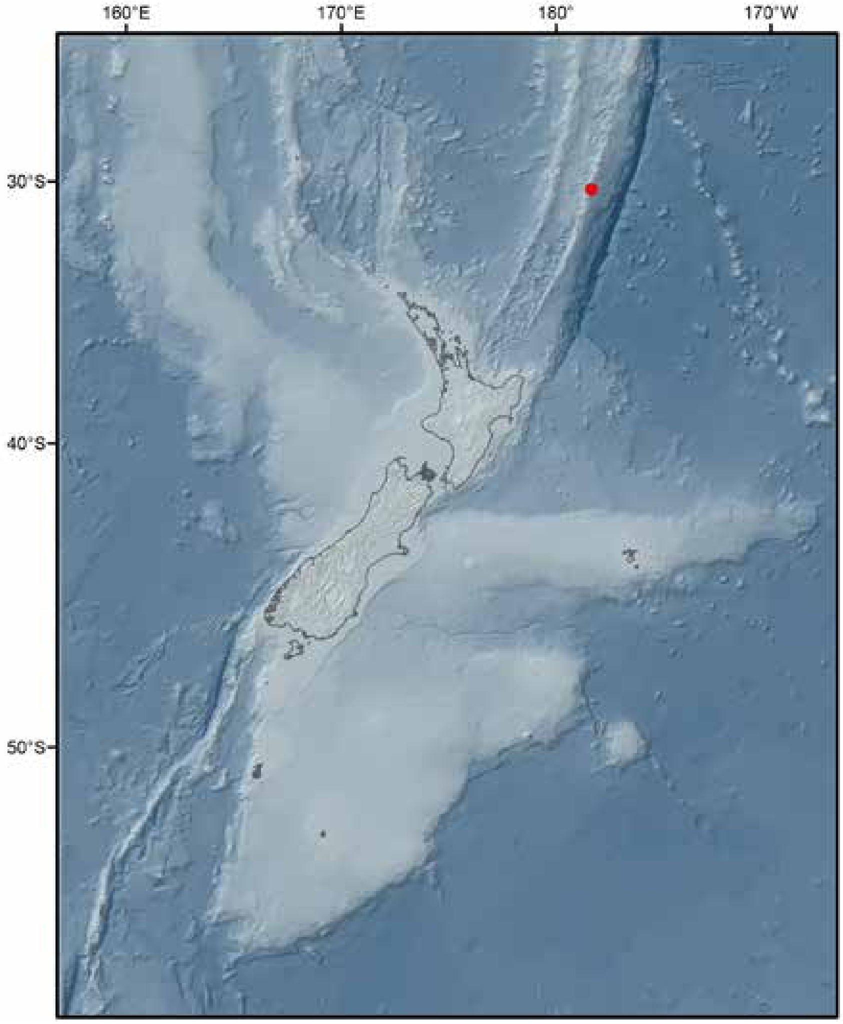


Figure 42. *Uroptychus baeomma* Baba, 2018, female, NIWA 23360: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left and right Mxps 3; **H.** right cheliped, dorsal; **I.** right cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, P3, lateral. Scale bars = 2 mm.

Figure 43. Distribution of *Uroptychus baeomma* Baba, 2018 around New Zealand.



4.0, 3.3 mm). *Chatham Rise*: NMNZ CR.25213, NZOI Stn J55, 44°05.50′S, 176°12.00′E, 198 m, 17 May 1970, 1 female ov. (5.6 mm, pcl 4.0 mm).

Other material. *Northland Plateau*: NIWA 23369, NZOI Stn I19, 35°25.20–25.40′S, 175°00.40–01.50′E, 270–342 m, 5 May 1975, 1 male (5.0 mm, pcl 3.2 mm), 1 female ov. (5.0 mm, pcl 3.4 mm); NMNZ CR.025212, NZOI Stn I19, 35°25.20–25.40′S, 175°0.40-1.50′E, 270–342 m, 5 May 1975, 1 female (5.1 mm, pcl 3.5 mm).

Northwest New Zealand: NMNZ CR.025215, NZOI Stn E887, 36°40.00′S, 173°53.00′E, 196–379 m, 23 Mar 1968, 1 male (4.9 mm, pcl 3.4 mm).

Bay of Plenty, *Mahina Knoll*: NIWA 9015, NIWA Stn TAN0413/137, 37°19.86–19.50′S, 177°04.52–04.53′E, 375–414 m, 14 Nov 2004, 1 female (4.6 mm, pcl 3.0 mm); NIWA 9014, NIWA Stn TAN0413/140, 37°21.35–21.21′S, 177°06.09–06.08′E, 259–294 m, 14 Nov 2004, 1 male (4.9 mm, pcl 3.2 mm), 2 female ov. (5.4, 4.9 mm, pcl 3.8, 3.1 mm), 1 female (5.0 mm, pcl 3.4 mm); NMNZ CR.023713, NZOI Stn R67, 37°21.50′S, 177°05.90′E, 283–308 m, 19 Jan 1979, 4 female ov. (5.4, 5.3, 5.2, 4.9 mm, pcl 3.9, 3.7, 3.8, 3.2 mm), 2 males (6.5, 4.3 mm, pcl 4.4, 3.0 mm);

Bay of Plenty, *off White Island*: AM P.102309 (ex NIWA 106418), same station as holotype, 4 females ov. (6.3, 5.7, 5.6, 5.6 mm, pcl 4.4, 4.2, 3.9, 3.8 mm), 1 male (5.6 mm, pcl 3.9 mm); NIWA 81214, RV *Sonne* station SO-135-DR 99-19, 37°36.91–36.75′S, 177°05.74–05.72′E, 165–170 m, 09 Oct 1998, 1 female (4.8 mm, pcl 3.4 mm).

Challenger Plateau: NMNZ CR.023733, NZOI Stn E908, 38°37.99′S, 172°41.00°E, 256 m, 28 Mar 1968, 1 male (4.7 mm, pcl 3.2 mm).

Southwest New Zealand: NMNZ CR.025214, NZOI Stn B621, 43°58.99′S, 168°20.4′E, 117–84 m, 19 Oct 1962, 1 female (4.5 mm, pcl 3.0 mm).

Chatham Rise: NIWA 23784, NIWA Stn TAN0601/7, 43°38.20–36.55′S, 177°31.63–34.17′E, 322–309 m, 29 Dec 2005, 1 female ov. (4.4 mm, pcl 3.5 mm; sequenced, see Fig. 5), 1 female (4.0 mm, pcl 2.6 mm); NIWA 106424, NIWA Stn TAN1401/124, 43°01.55′S, 177°22.07′E, 304 m, 24 Jan 2014, 1 male (5.3 mm, pcl 3.7 mm).

Otago Shelf: NMNZ CR.023716, PMBS Stn Mu 73–124, 45°51.4′S, 171°01′E, 420 m, 13 Jun 1973, 2 males (5.6, 4.9 mm, pcl 4.0, 3.3 mm); NMNZ CR.025191, PMBS Stn Mu 67-81, 45°55.00′S, 171°02.50′E, 512–329 m, 20 Jun 1967, 2 females ov. (5.5, 4.9 mm, pcl 3.9, 3.4 mm).

Type locality. Off White Island, 250–310 m.

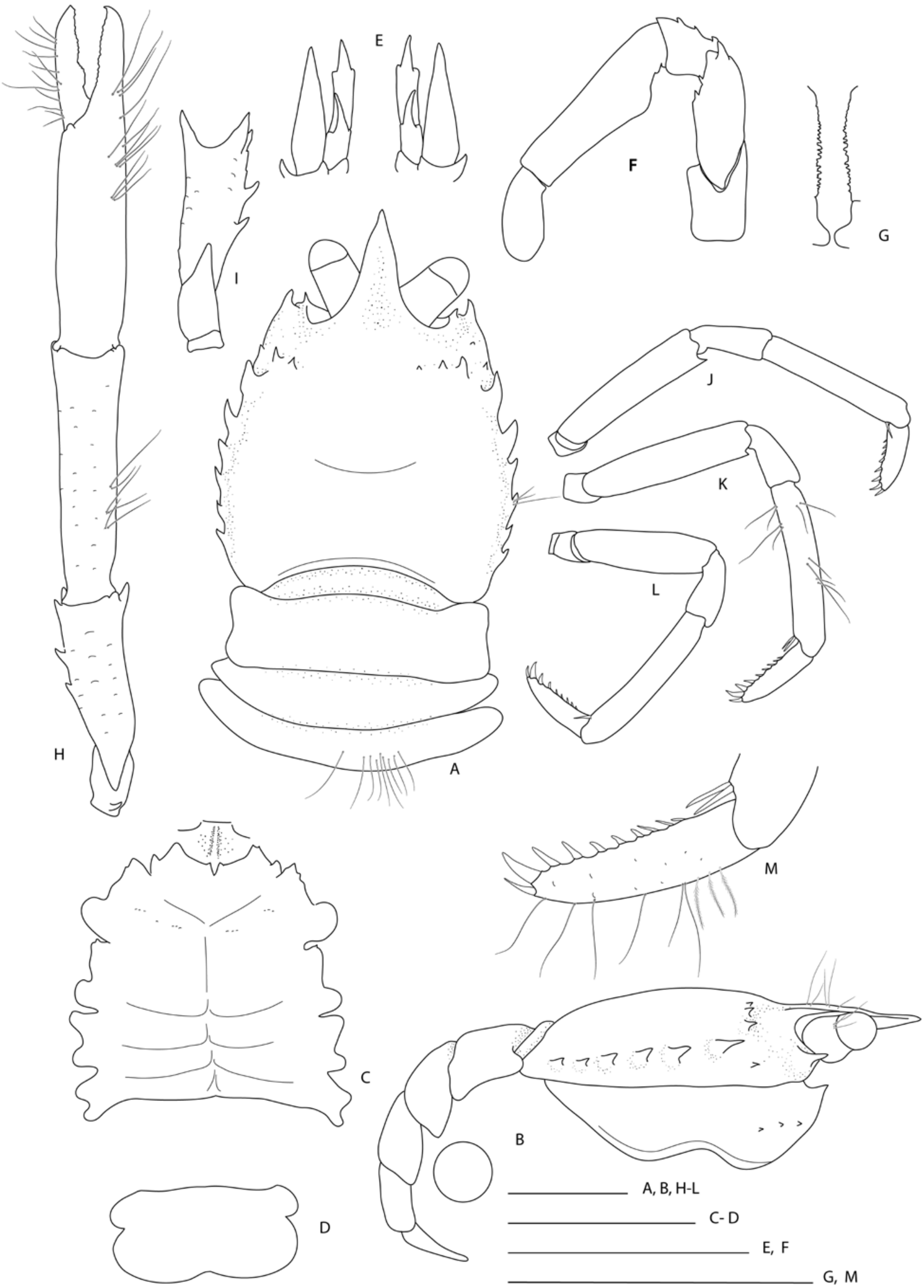
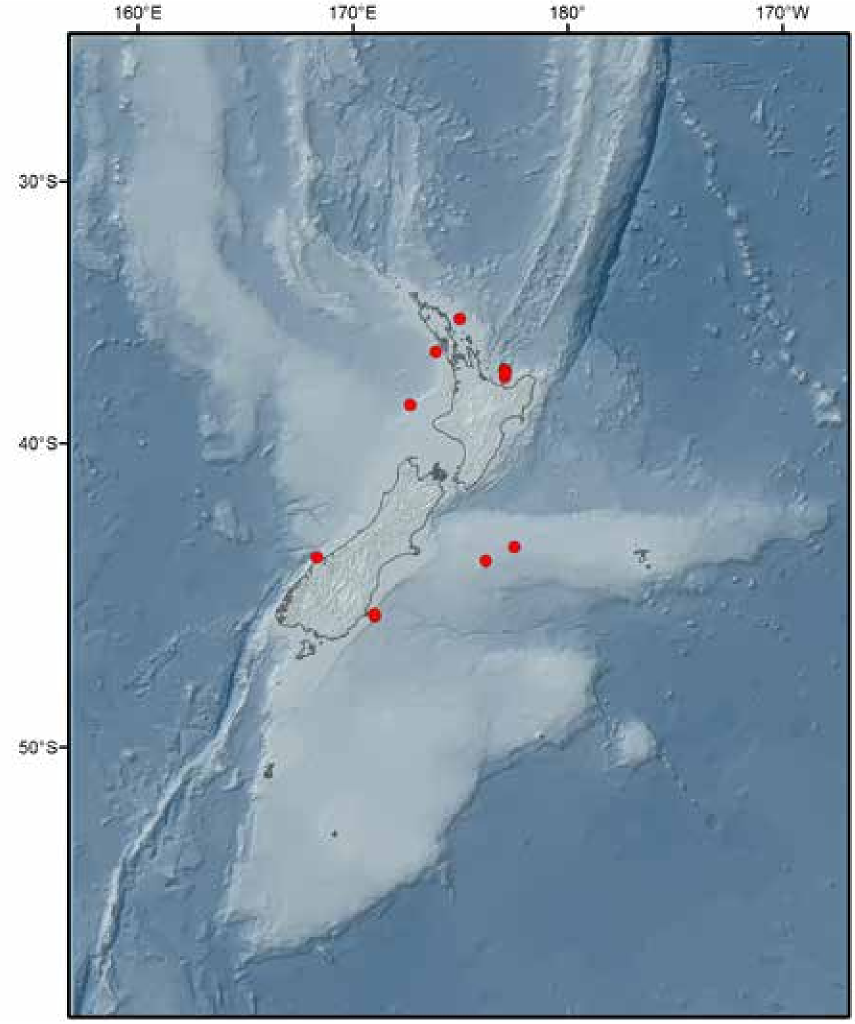


Figure 44. *Uroptychus bathamae* **sp. nov.**, holotype, female ov., NIWA 81213: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral, and egg; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left and right Mxps 3; **H.** right cheliped, dorsal; **I.** right cheliped ischiomerus, ventral; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, P3, lateral. Scale bars = 2 mm.

Figure 45. Distribution of *Uroptychus bathamae* **sp. nov.** around New Zealand.



Distribution. Continental New Zealand, from western and eastern Northland Plateau, Bay of Plenty, Hikurangi Margin, Chatham Rise, Otago Shelf, and west off South Island, 117–512 m (Fig. 45).

Habitat. This species appears restricted to the edges of the New Zealand continental shelf and mostly softer sediments. There are no records that point to faunal associations.

Diagnosis. Carapace dorsal surface setose and smooth except for some scattered parahepatic and hepatic spines; lateral margin with prominent anterolateral spine, overreaching smaller lateral orbital spine, followed by 5 or 6 lateral branchial spines. Rostrum narrow triangular (basal width < 0.5 distance between anterolateral spines). Excavated sternum with transverse anterior margin, with low median ridge. Anterior margin of sternite 3 with median notch and small submedian spines. Sternite 4 anterolateral margin longer than posterolateral margin. Antennal scale distinctly overreaching end of antennal peduncle; articles 4 and 5 with large distal spines each. P2–4 meri and carpi dorsally unarmed; propodi with pair of terminal spines only on flexor margin; dactyli tapering distally, flexor margin with 9–12 inclined, loosely arranged, slender spines; penultimate flexor marginal spine prominent, about twice width of antepenultimate; ultimate spine slightly narrower than antepenultimate.

Description. Carapace: pcl 0.8 × width, moderately convex from side to side. Dorsal surface sparsely setose; cervical groove indistinct (faintly indicated); unarmed except for scattered small spines in hepatic region (lateral parahepatic spines, 2 or 3 pairs). Anterolateral spine well-developed, overreaching small lateral orbital spine. Lateral carapace margin convexly divergent posteriorly; with 7 spines (or processes) excluding anterolateral spine: 1 hepatic, 1 anterior branchial, 4–6 [5] posterior branchial spines; anterior branchial spine largest. Rostrum narrow triangular (basal breadth < 0.5 × distance between anterolateral spines), horizontal, 0.5 × pcl (ranging from 0.3–0.6); dorsal surface slightly dorsally excavated; lateral margins smooth. Pterygostomian flap covered with spines or spinules (1 median row of about 3 spines); anterior margin produced into spine.

Thoracic sternum: Excavated sternum anteriorly transverse, with finely ridged midline. Sternal plastron 1.1 × as wide as long, sternites 5–7 laterally subparallel; surface smooth. Sternite 3 anterolaterally acute, ending in pair of small spines; median notch separating submedian spines; lateral margins with distinct spine.

Sternite 4 2.0 × as wide as sternite 3, anteriorly shallow concave, with short rows of setae; midline grooved; anterolateral margin acute, apex not overreaching sternite 3; lateral margins unarmed; anterolateral margin slightly longer than posterolateral margin. Sternite 5 anteriorly acute but unarmed, with irregular row of granules.

Abdomen: Tergites smooth, unarmed; without ridges. Pleural margins of somites 2–4 rounded. Telson 2.1 × as broad as long; posterior margin emarginated; posterior portion 1.6 × length of anterior portion.

Eyes: Sparsely setose. Cornea globular, 0.3 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine. Article 3 unarmed. Article 4 with large distal spine, spine longer than article itself, overreaching midlength of article 5; mesial margin unarmed. Article 5 armed with large distomedian spine; mesial margin unarmed; 1.6 × as long as article 4. Antennal scale overreaching peduncle; 3.5 × as long as wide.

Maxilliped 3: Coxa with small lateral spine only. Basis smooth along mesial ridge. Merus and ischium with surface smooth, unarmed; crista dentata with fine denticles. Merus extensor margin with strong distal spine; flexor margin with two median spines. Carpus extensor margin with 3 or 4 small spines.

Cheliped: Slender; 4.3 × pcl; surface moderately setose, covered with tufts of fine, long setae. Ischium with dorsal distal spine. Merus with 1 or 2 strong mesial spines and 2 or 3 distoventral spines. Carpus surface smooth and glabrous; unarmed distally; length 1.1 × that of palm. Palm 3 × as long as broad, unarmed, sparsely covered with long setae. Dactylus 0.5 × as long as propodus; occlusal margins denticulate, without gape.

Pereopods 2–4: Similar; surface slightly setose. Merus dorsal margin unarmed, ventral margin with distal spine; length 1.0–0.8 × that of propodus (propodi successively lengthening from P2 to P4); P4 merus 0.9 × length of P2. Carpus unarmed. Propodus 5.5–5.7 × longer than wide; extensor margin smooth; flexor margin not inflated distally, with only distal pair of spines; two times as long as dactylus. Dactylus nearly straight; flexor margin with 9–12 [9–11] regularly and obliquely arranged spines along distal ¾; ultimate spine distinctly smaller than penultimate spine, subequal to or slightly smaller than antepenultimate.

Etymology. Named after Elizabeth (Betty) Batham (1917–1974) for her contributions to New Zealand marine sciences.

Remarks. *Uroptychus bathamae* **sp. nov.** is a small species with a pcl of 2.6–4.4 mm. Characters vary little across the specimens, e.g. the length of the rostrum ranges from 0.3–0.6 × pcl. Two specimens from the Otago shelf (NMNZ CR.025191) are thickly covered with plumose setae, while all others are sparsely covered with long setae. All specimens have at least one parahepatic spine on the dorsal carapace surface, but as many as two or three distinct spines can be seen in a transverse row in the hepatic area. Lateral branchial spines can range from five (e.g. small females, NIWA 106418) to seven (male, NMNZ CR.025215), with six in the female holotype (Fig. 44A). The anteriormost branchial spine is always most prominent and the size diminishes progressively towards the posterior margin. The number of spines on the P2–4 dactyli can be as many as 12 (male NMNZ CR.025215) but is usually eight or nine (the P3 of the holotype has 10 and 11 spines on the right and left, respectively, nine spines each on the right P2 and P4).

Uroptychus bathamae **sp. nov.** is linked to *U. belos* Ahyong & Poore, 2004 and *U. leptus* **sp. nov.** with which it shares lateral spines on the carapace and unarmed extensor margins of the P2–4 meri and carpi, only a pair of distal spines on the flexor margins of propodi, subequal length of dactyli of P2–4 and prominent penultimate spine. *Uroptychus leptus* **sp. nov.** is only known from a single specimen that has lost its chelipeds, but it clearly differs from *U. bathamae* **sp. nov.** in having the lateral carapace margins nearly subparallel (instead of distinctly convex), bearing three lateral spines (instead of five to seven branchial spines and a small hepatic spine), the pterygostomian flap smooth and anteriorly rounded (with a median row of spines and a distinct anterior spine) and the walking legs more slender (propodus length-width is 7–8, compared to a ratio of < 6 in *U. bathamae* **sp. nov.**). Differences between *U. bathamae* **sp. nov.** and *U. belos* are discussed under the account of the latter species below.

Uroptychus bathamae **sp. nov.** is otherwise close to *U. tasmani* **sp. nov.** but they differ in the following features: the cheliped carpus is always unarmed in *U. bathamae* **sp. nov.** but serrated with a few small spines in *U. tasmani* **sp. nov.**; the hepatic region is more spinose and the lateral rostral margin is serrate in *U. tasmani* **sp. nov.**, but both are smooth in *U. bathamae* **sp. nov.**; and the distal two antennal articles each bear a large distal spine in *U. bathamae* **sp. nov.** while these are only small in *U. tasmani* **sp. nov.** Most notably, the P2–4 dactyli are subequal in length in *U. bathamae* **sp. nov.** whereas the dactylus of P4 is clearly longer than that of P2 in *U. tasmani* **sp. nov.**, and the P4 dactylus is about 0.6 × merus length in *U. bathamae* **sp. nov.** compared to nearly 0.9 × in *U. tasmani* **sp. nov.**

The male NMNZ CR.023733 bears two rhizocephalan externae under the abdomen.

DNA sequence data. Intraspecific sequence divergence for partial CO1 gene: 2.4% (NIWA 9016, 23784). Closest interspecific sequence divergences: *Uroptychus ahyongi* **sp. nov.** (14.4–15.3%) and *U. enriquei* (15.6–16.0%).

ZooBank registration. *Uroptychus bathamae* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:C0ACFD76-D601-409E-8C5D-38DC645106F5.

Uroptychus belli sp. nov. Figs 46–50

Material examined. Holotype NIWA 106421, NIWA Stn TAN1401/124, 43°01.55′S, 177°22.07′E, Chatham Rise, 304 m, 24 Jan 2014, female ov. (7.1 mm, pcl 5.5 mm). **Paratypes** *Chatham Rise*: NIWA 92059, locality details same as for holotype, 11 females ov. (8.9, 8.7, 8.5, 8.5, 8.3, 8.0, 8.0, 7.9, 7.5, 7.0, 6.6 mm, pcl 6.7, 6.6, 6.3, 6.5, 6.3, 5.6, 6.1, 5.8, 5.3, 5.2, 5.0 mm), 3 females (6.8, 6.1, 2.9 mm, pcl 5.0, 4.4, 1.9 mm), 2 males (8.5, 7.9 mm, pcl 6.5, 6.0 mm); NIWA 23783, NIWA Stn Z10986, 43°28.54′S, 177°45.28′E, 343 m, 31 Dec 2001, 1 male (rostrum broken, pcl 5.9 mm). *Challenger Plateau*: NMNZ CR.025227, NZOI Stn E908, 38°38.00′S, 172°41.00′E, 256 m, 28 Mar 1968, 1 female ov. (8.4 mm, pcl 6.0 mm), 2 females (6.6, 4.9 mm, pcl 4.7, 3.4 mm), 2 males (7.3, 5.8 mm, pcl 5.3, 4.0 mm).

Other material. *Bay of Plenty*: NIWA 23656, NIWA Stn TAN0601/7, 43°38.20–36.65′S, 177°31.63–34.17′E, 322–309 m, 29 Dec 2005, 2 females (8.8, 8.0 mm, pcl 6.4, 5.9 mm); NIWA 10200, NIWA Stn TAN0413/137, 37°19.86–19.50′S, 177°04.52–04.53′E, 375–414 m, 14 Nov 2004, 1 female ov. (7.4 mm, pcl 5.5 mm); NIWA 10199, NIWA Stn TAN0413/129, 37°20.41–20.26′S, 177°06.69–06.81′E, 335–275 m, 14 Nov 2004, 1 female ov. (6.9 mm, pcl 5.2 mm); NIWA 10201, NIWA Stn TAN0413/136, 37°21.74–21.40′S, 177°06.63–06.63′E, 632–458 m, 14 Nov 2004, 1 male (5.9 mm, pcl 4.2 mm); NIWA 23380, NIWA Stn KAH9907/48, 37°28.15–28.09′S, 177°06.70–06.57′E, off White Island, Bay of Plenty, 250–310 m, 05 Jun 1999, 1 female ov. (6.9 mm, pcl 5.0 mm), 1 female (5.3 mm, pcl 3.7 mm), 1 male (7.2 mm, pcl 5.5 mm); NMNZ CR.025221, NZOI Stn R100, 37°21.96–21.50′S, 176°28.50–31.00′E, Mayor Island, 448–388 m, 22 Jan 1979, 1 male (5.8 mm, pcl 4.0 mm); NMNZ CR.025228, NZOI Stn J676, 37°22.5′S, 177°11.70′E, 341–353 m, 8 Sep 1974, 1 female ov. 6.7 mm, pcl 5.1 mm); NMNZ CR.025230, NZOI Stn J678, 37°24.70′S, 177°12.00′E, 352–350 m, 8 Sep 1974, 1 female (7.0 mm, pcl 5.6 mm).

Challenger Plateau: NIWA 12008, NZOI Stn C632, 39°14.00′S, 172°01.00′E, 406 m, 27 May 1961, 1 female (6.6 mm, pcl 4.5 mm); NMNZ CR.025223, NZOI Stn C633, 39°16.00′S, 171°54.00′E, 344 m, 27 May 1961, 1 female ov. 7.3 mm, pcl 5.5 mm); NMNZ CR.025224, NZOI Stn C634, 39°18.00′S, 171°48.00′E, 366 m, 27 May 1961, 2 female ov. (8.6, 8.4 mm, pcl 6.4, 6.1 mm).

Chatham Rise: NMNZ CR.023714, NZOI Stn R21, 42°37.20′S, 173°42.00′E, 503 m, 13 Jan 1979, 1 male (6.0 mm, pcl 4.0 mm); NMNZ CR.025222, NZOI Stn A910, 43°4.00′S, 178°39.00′W, 549 m, 13 Sep 1963, 1 female ov. (6.7 mm, pcl 4.8 mm); NMNZ CR.025216, NZOI Stn A910, 43°04.00′S, 178°39.00′W, 549 m, 13 Sep 1963, 1 male (5.0 mm, pcl 3.4 mm); NIWA

Figure 46. Live coloration of *Uroptychus belli* **sp. nov.**, NIWA 53582, Stn TAN0905/97, female ov. Scale = 1 mm.

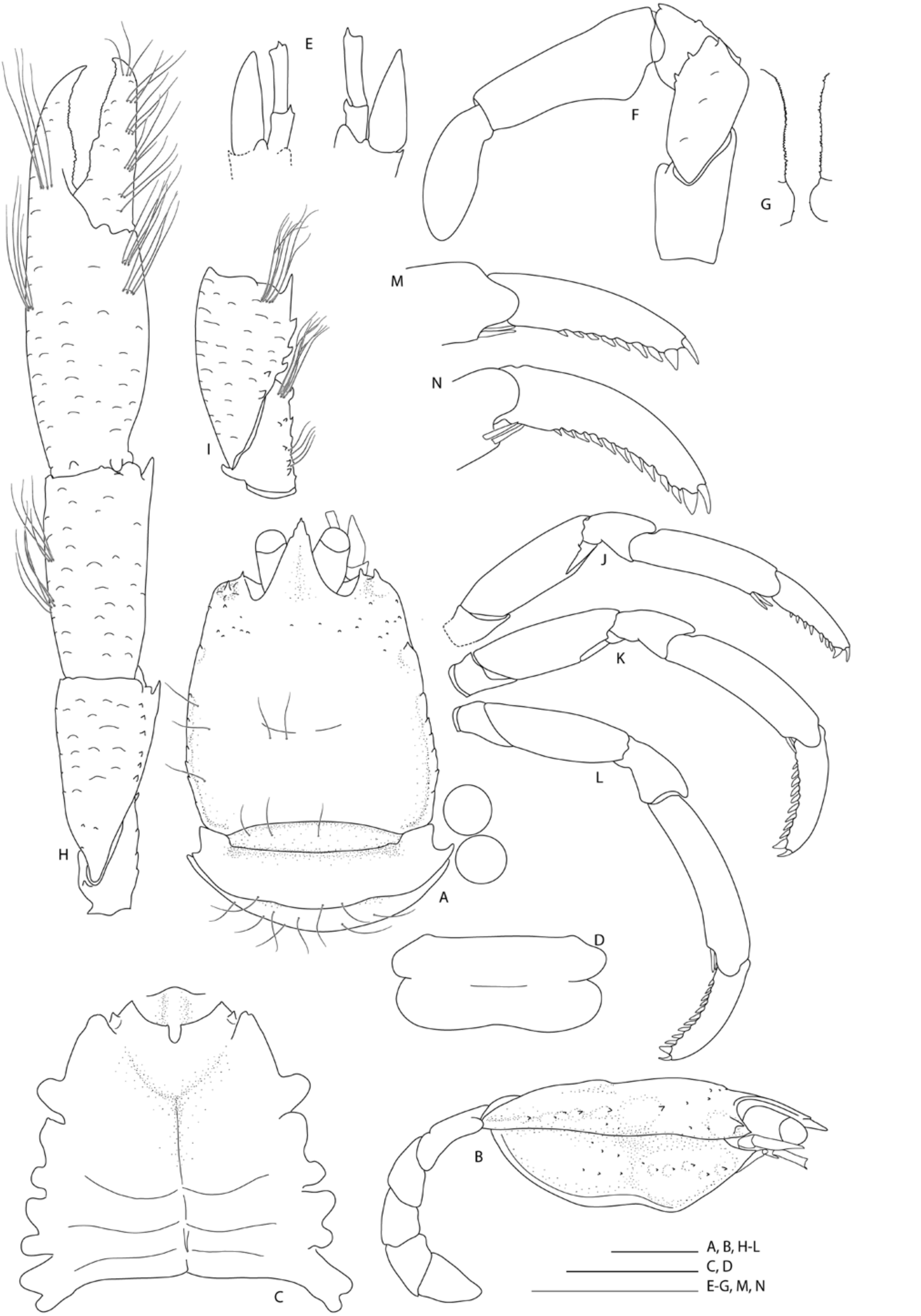


Figure 47. *Uroptychus belli* **sp. nov.**, holotype, female ov., NIWA 106421: **A.** carapace and abdomen and two eggs, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left and right Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, P2, lateral; **N.** distal portion of propodus and dactylus, P4. Scale bars = 2 mm.

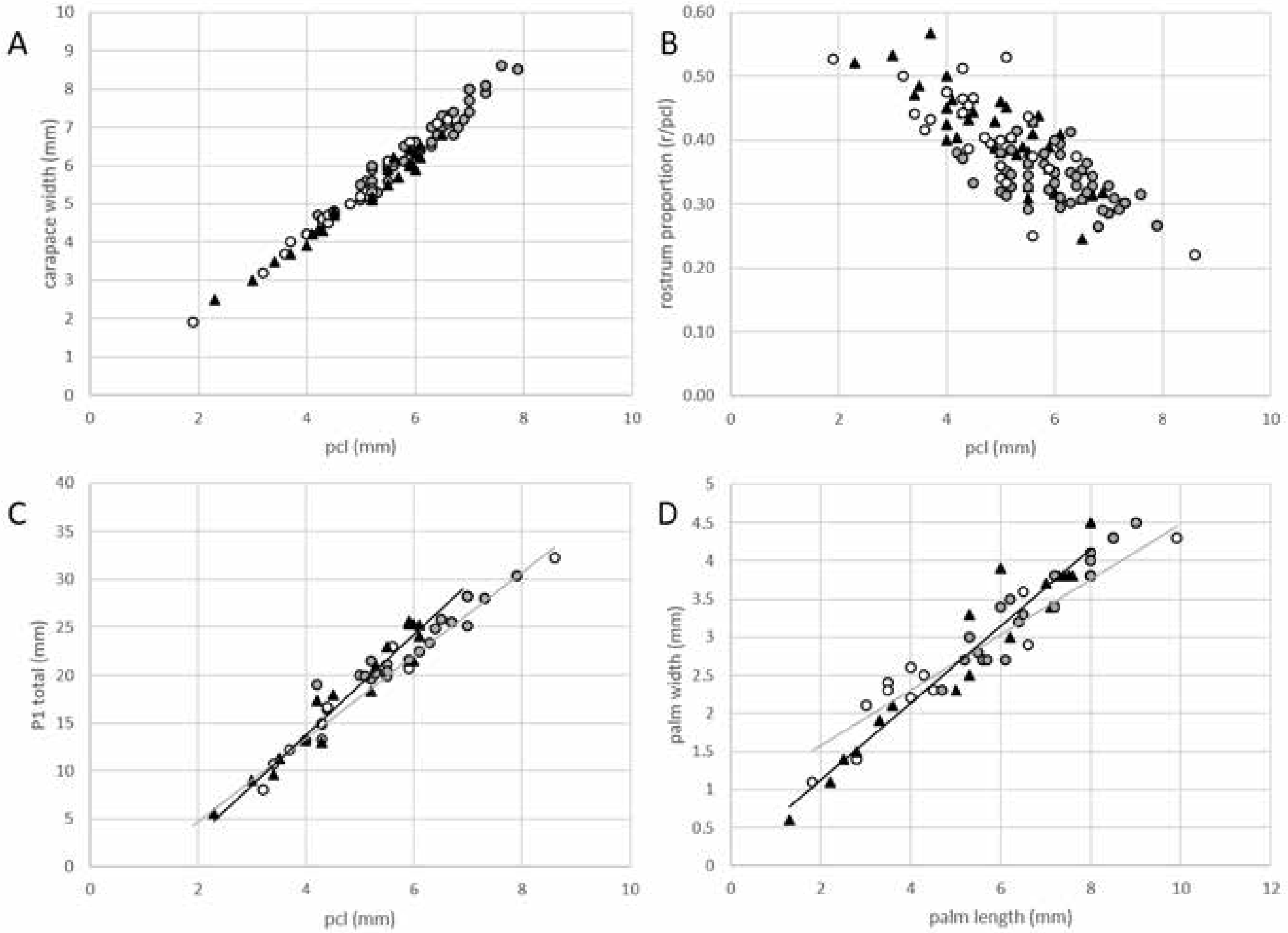


Figure 48. Comparative meristics for *Uroptychus belli* **sp. nov.** for males (black triangles), females (white circles) and ovigerous females (grey circles): **A.** Carapace post-orbital length (pcl) versus carapace width (in mm); **B.** pcl versus the rostral proportion (rostrum/pcl); **C.** pcl versus total length of the cheliped (P1); **D.** cheliped palm length versus width. Trendlines for males is solid black and for females is grey.

23378, NIWA Stn KAH0108/21, Z10929, 43°07.26′S, 175°55.14′E, 467 m, 04 Sep 2001, 1 female ov. (9.0 mm, pcl 7.0 mm); NIWA 23379, NIWA Stn KAH0109/22, Z10931, 43°08.22′S, 175°50.23′E, 441, 30 Oct 2001, 2 females ov. (8.9 mm broken rostrum, pcl 6.9 mm, 6.5 mm); NIWA 23381, NIWA Stn KAH0109/22, Z10931, 43°08.22′S, 175°50.23′E, 441 m, 30 Oct 2001, 1 female ov. (8.0 mm, pcl 5.8 mm), 1 female (6.3 mm, pcl 4.3 mm), 2 males (6.5, 5.6 mm, pcl 4.5, 4.0 mm); NIWA 9809, NIWA Stn TAN9701/105, 43°14.77–16.87′S, 178°24.85–27.78′E, 372–386 m, 22 Jan 1997, 1 female ov. (8.2 mm, pcl 6.3 mm); NIWA 9810, TAN9701/105, 43°14.77–16.87′S, 178°24.85–27.78′E, 372–386 m, 22 Jan 1997, 1 female (6.5 mm, pcl 4.3 mm); NIWA 76455, NIWA Stn TAN1008/37, 43°25.01–25.37′S, 179°58.98′W–179°59.00′E, 401–407 m, 20 Jun 2010, 5 males (6.9, 6.0, 4.6, 3.6 mm, pcl 5.3, 4.8, 4.2, 3.1, 2.3 mm; 4.2 mm male sequenced, see Fig. 5); NIWA 88746, SOP Stn TRIP4071/16, 43°25–24′S, 173°29′E, 409–458 m, 10 Apr 2014, 2 males (4.6, 3.5 mm, pcl 3.0, 2.3 mm; small male sequenced, see Fig. 5); NIWA 105941, NIWA Stn TAN0301/22, 43°25.73–22.69′S, 179°55.36–04.85′W, 400–428 m, 01 Jan 2003, 2 females ov. (8.6, 8.1 mm, pcl 6.8, 6.0 mm); NIWA 9799, NIWA Stn TAN9701/101, 43°26.61–23.7′S, 177°32.22–33.88′E, 325–298, 22 Jan 1997, 2 females (6.2, 4.8 mm, pcl 4.3, 3.2 mm); NIWA 9811, NZOI Stn Q13, 43°27.60′S, 179°45.85′W, 415 m, 15 Mar 1978, 1 female ov. (6.9 mm, pcl 5.2 mm); NIWA 45328, TAN0801/16, 43°27.87′S, 179°45.85′W, 416–420, 30 Dec 2007, 1 male (7.3 mm, pcl 5.5 mm); NIWA 11884, NZOI Stn W426, 43°31.17′S, 175°37.62′E, 419–320 m, 19 Feb 1995, 1 female ov. (8.0 mm, pcl 6.0 mm); NIWA 26455, NIWA Stn TAN0604/108, 43°31.97–32.09′S, 179°37.68–37.54′E, Main Knoll, 375–381 m, 06 Jun 2006, 4 females ov. (8.8. 8.0, 7.9, 7.0 mm, pcl 6.5, 5.8, 6.1, 5.1 mm), 3 females (7.0, 6.8, 6.7 mm, pcl 5.0, 5.1, 5.0 mm), 8 males (9.1, 8.8, 8.6, 8.0, 7.9, 7.6, 7.5, 7.0 mm, pcl 6.9, 6.7, 6.1, 5.6, 6.0, 5.5, 5.4, 4.9 mm); NIWA 26456, NIWA Stn TAN0604/108, 43°31.97–32.09′S, 179°37.68–37.54′E, Main Knoll, 375–381 m, 06 Jun 2006, 1 female ov. (7.5 mm, pcl 5.5 mm); NIWA 26457, NIWA Stn TAN0604/110, 43°31.85–31.67′S, 179°37.75–37.98′E, Main Knoll, 378–390 m, 07 Jun 2006, 11 specimens (not measured); NIWA 11597, NZOI Stn Z3924B, 43°34.00′S, 179°39.00′E, 388 m, 20 May 1981, 1 female ov. (5.9 mm, pcl 4.3 mm); NIWA 23382, NZOI Stn Z3925, 43°34.83′S, 179°38.76′E, 394 m, 20 May 1981, 1 female ov. (8.0 mm, pcl 5.9 mm);

NIWA 11483, NIWA Stn TAN1301/111, 43°35.92–35.98′S, 179°22.76–23.14′W, 386–386 m, 20 Jan 2013, 1 female (7.8 mm, pcl 5.1 mm); NIWA 89562, NIWA Stn TAN1301/111, 43°35.92–35.98′S, 179°22.76–23.14′W, 386–386 m, 20 Jan 2013, 1 female ov. (7.8 mm, pcl 5.9 mm), 1 male (8.0 mm, pcl 5.9 mm); NIWA 23377, NZOI Stn Q11, 43°44.10′S, 179°31.60′W, 300 m, 15 Mar 1978, 1 female ov. (7.5 mm, pcl 5.5 mm), 1 male (8.0 mm, pcl 6.1 mm); NMNZ CR.025217, NZOI Stn J59, 43°51.00′S, 179°25.00′E, 309 m, 20 May 1970, 19 specimens (not measured); AM P.102313 (ex NIWA 106420), NIWA Stn TAN0401/50, 43°55.88–53.48′S, 175°24.04–21.54′W, 242–241 m, 06 Jan 2004, 3 females ov. (8.0, 6.8, 6.8 mm, pcl 5.9, 5.0, 5.0 mm), 2 females (7.7, 5.1 mm, pcl 5.6, 3.6 mm), 1 male (8.2 mm, pcl 5.9 mm); NIWA 105946, NIWA Stn TAN0301/51, 43°56.01–58.26′S, 175°22.48–40.29′W, 232–208 m, 06 Jan 2003, 10 specimens, (poorly preserved). NMNZ CR.025218, NZOI Stn J55, 44°05.50′S, 176°12.00′E, 198 m, 17 May 1970, 1 female ov. (8.5 mm, pcl 6.1 mm); NIWA 23384, NZOI Stn Q341, 44°07.10′S, 176°19.20′E, 264 m, 14 Nov 1979, 2 females (7.9 mm, broken rostrum, pcl 5.5, 6.6 mm), 1 male (7.2 mm, pcl 5.2 mm); NIWA 23375, NZOI Stn I721, 44°07.40′S, 175°46.20′E, 540 m, 26 Mar 1979, 1 male (7.5 mm, pcl 5.5 mm); NMNZ CR.025226, NZOI Stn D899, 44°23.00′S, 176°49.00′W, 370 m, 29 Mar 1969, 3 males (7.4, 7.3, 5.2 mm, pcl 5.1, 5.0, 3.5 mm).

Chatham Rise, *Andes Seamount Complex*, *Diamond Head Seamount*: NIWA 53582, NIWA Stn TAN0905/97, 44°08.84–08.87′S, 174°41.4–41.68′W, 440–600 m, 26 Jun 2009, 3 females ov. (10.0, 9.0, 9.0 mm, pcl 7.9, 7.0, 6.7 mm); NIWA 70958, NIWA Stn TAN0905/97, 44°08.84–08.87′S, 174°41.40–41.68′W, 440–600 m, 26 Jun 2009, 1 male (8.2 mm, pcl 5.7 mm); NIWA 53603, NIWA Stn TAN0905/97, 44°08.84–08.87′S, 174°41.4–41.68′W, 440–600 m, 26 Jun 2009, 14 specimens (not measured, except female ov., pcl 5.3 mm sequenced, see Fig. 5).

Chatham Rise, *Andes Seamount Complex*, *Diamondhead Peak B*: NIWA 54081, NIWA Stn TAN0905/113, 44°08.97–09.02′S, 174°45.41–45.63′W, 519–609 m, 27 Jun 2009, 2 females ov. (7.2, 5.8 mm, pcl 5.2, 4.2 mm), 1 female (6.4 mm, pcl 4.4 mm). NIWA 54125, NIWA Stn TAN0905/114, 44°08.99–09.01′S, 174°46.09–46.30′W, 830–900 m, 27 Jun 2009, 1 female ov. (6.9 mm, pcl 5.1 mm).

Chatham Rise, *Andes Seamount Complex*, *Iceberg Seamount*: NIWA 105942, NIWA Stn TAN1503/116, 44°09.58–9.67′S, 174°33.29–33.36′W, 497–590 m, 11 Apr 2015, 1 female ov. (9.5 mm, pcl 7.3 mm; sequenced, see Fig. 5); NIWA 23383, NZOI Stn Q38, 44°24.80′S, 176°43.60′W, 345 m, 24 Mar 1978, 2 females ov. (7.3, 6.7 mm, pcl 5.2, 4.8 mm); NIWA 53834, NIWA Stn TAN0905/105, 44°09.44–09.55′S, 174°33.25–33.41′W, 485–533 m, 26 Jun 2009, 1 female ov. (9.5 mm, pcl 7.3 mm); NIWA 54274, NIWA Stn TAN0905/119, 44°09.49–09.69′S, 174°33.30–33.14′W, 487–616 m, 28 Jun 2009, 6 females ov. (10.0, 9.5, 9.3, 9.3, 8.9, 8.7 mm, pcl 7.6, 7.5, 7.2, 7.1, 6.3, 6.6 mm), 1 female (10.5 mm, pcl 8.6 mm), 5 males (8.8, 8.8, 8.1, 6.8, 6.3 mm, pcl 6.7, 6.5, 6.5, 4.9, 4.4 mm); NIWA 45329, TAN0801/61, 44°12.89′S, 179°18.03′W, 414–452 m, 09 Jan 2008, 1 female (5.9 mm, pcl 4.0 mm); NIWA 23376, NZOI Stn Q25, 44°26.20′S, 176°38.40′W, 360 m, 22 Mar 1978, 1 male (6.6 mm, pcl 4.5 mm).

Wairarapa Coast and Cook Strait: NMNZ CR.023549, SOP Stn TRIP2479/21, 40°25′S, 177°07′E, NE of Castle Point, 836 m, 18 Aug 2007, 1 male (6.9 mm, pcl 5.0 mm); NMNZ CR.25229, VUW Stn VUZ51 DOP, 41°35.00′S, 174°53.00′E, Palliser Bay, Cook Strait, 366–549 m, 22 Feb 1956, 2 female ov. (9.0, 6.0 mm, pcl 6.6, 4.5 mm), 1 male (7.9 mm, pcl 5.6 mm). NMNZ CR.025220, RV *Acheron* Stn BS292, off Turakirae Head, Palliser Bay, 448–512 m, 11 May 1972, 13 specimens (not measured).

Otago Shelf: NMNZ CR.025219, PMBS Stn Mu 67–81, SE Taiaroa, 512–329 m, 20 Jun 1967, 1 male (5.7 mm, pcl 4.0 mm).

Subantarctic New Zealand region, *Campbell Rise*: NIWA 44798, NZOI Stn D175, 50°36.49′S, 167°40.99′E, 426 m, 21 Nov 1964, 2 females ov. (10.1, 9.4 mm, pcl 8.0, 7.3 mm), with *Goniocorella dumosa*.

Subantarctic New Zealand region, *Campbell Plateau*: NMNZ CR.025225, NZOI Stn D175, 50°36.50′S, 167°41.00′E, 426 m, 21 Jan 1964, 1 female ov. (7.5 mm, pcl 5.3 mm), 1 male (6.4 mm, pcl 4.4 mm).

Type locality. Chatham Rise, 304 m.

Distribution. Bay of Plenty, Chatham Rise, Otago Shelf, Campbell Rise, Challenger Plateau, 154–906 m (Fig. 50).

Habitat. Collected both from soft sediment and seamount habitats of the continental shelf. Several specimen labels include references to associations with the hard corals, *Goniocorella dumosa* (NIWA 53582, 88746 and 44798) and ?*Solenosmilia variabilis* (NMNZ CR.023549).

Diagnosis. Carapace about as long as wide (without rostrum), unarmed on dorsal surface other than row of feeble epigastric granules and small hepatic granules. Anterolateral spine distinctly larger than lateral orbital spine. Lateral margin with row of small spines, anterior branchial spine largest. Rostrum basal width about half distance between anterolateral spines, with pair of subapical spines or at least distinct serration along distal portion, overreaching cornea. Sternite 3 with median notch, without submedian spines; sternite 4 posterolateral margin shorter than anterolateral.

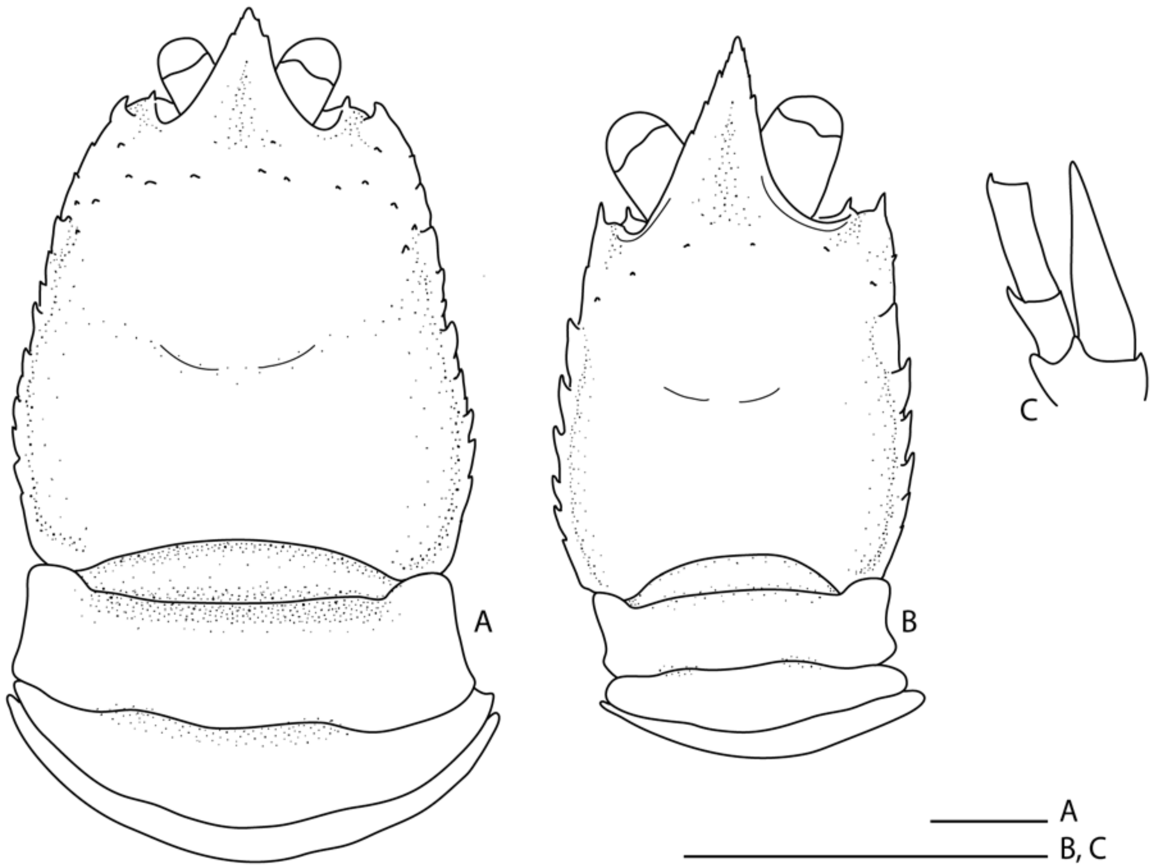


Figure 49. *Uroptychus belli* **sp. nov.**: **A.** female ov., carapace and abdomen, NIWA 53582, pcl 7.0 mm; **B.** female paratype NIWA 92059, carapace and abdomen, pcl 1.9 mm; **C.** female paratype NIWA 92059, antennal peduncle, left, ventral. Scale bars A, B = 2 mm, C = 1 mm.

Antennal peduncle with distal spines on both articles 4 and 5 (may be minute on article 5); antennal scale reaching or slightly overreaching end of peduncle. Cheliped stout, setose; carpus and palm subequal in length. P2–4 meri and carpi unarmed; propodi with distal pair of spines on flexor margin only; dactyli slender, not truncate; distinctly increasing in size from anterior to posterior; flexor margin with 4–15 loosely arranged, inclined spines (fewer on P2 than P4); ultimate spine more slender than penultimate, penultimate about twice width of antepenultimate.

Description. Carapace: [0.9]–1.0 × as long as broad (pcl), shallow convex from side to side. Dorsal surface smooth or with varying numbers of scattered granules in hepatic and epigastric regions, otherwise unarmed; cervical groove indistinct (faintly indicated). Lateral orbital spine present, smaller than anterolateral spine. Anterolateral spine well-developed, lateral margins convexly divergent posteriorly; with [7]–9 small spines excluding anterolateral spine: 1 or 2 hepatic, [1]–3 anterior branchial, 4–6 posterior branchial spines; anterior branchial largest. Rostrum narrow triangular (basal breadth < 0.5 × distance between anterolateral spines), horizontal, 0.2–0.5 [0.3] × pcl (0.5 × in smallest specimen); 0.9–1.1 [1.0] × longer than wide at base (smallest specimen 1.1 ×); dorsal surface excavated; lateral margins with fine serration along distal portion and with pair of subapical spines. Pterygostomian flap lateral surface with median row of spines in anterior portion; anterior margin produced into spine.

Thoracic sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron 1.1 × as wide as long, widening posteriorly; surface smooth. Sternite 3 anterolaterally produced; anterior margin with median notch present, lacking submedian spines; lateral corners produced to distinct spine. Sternite 4 2.1 × as wide as sternite 3, anteriorly depressed, broadly concave; midline grooved; anterolateral margin rounded, covered with small denticles, reaching terminus of lateral spine on sternite 3; laterally; anterolateral margin distinctly longer than posterolateral margin.

Abdomen: Tergites smooth and unarmed. All tergites without ridges. Pleural margins of somites 2 to 4 rounded. Telson 2.2 × as broad as long; posterior margin emarginated; posterior portion 1.2 × length of anterior portion.

Eyes: Smooth. Cornea subglobular, 0.2–[0.4] × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine. Antennal article 3 unarmed. Article 4 with small distal spine; mesial margin unarmed. Article 5 armed with small or minute distomedian spine; mesial margin unarmed; two times as long as article 4. Antennal scale overreaching peduncle or reaching or nearly reaching end of article 5; 2.6–2.8 × as long as wide.

Maxilliped 3: Coxa with small disolateral spine. Basis smooth along mesial ridge. Merus and ischium with surface smooth; ischium without distal spines; merus extensor margin with distal spine; flexor margin with two spines in distal third; crista dentata with 30 obsolescent, minute denticles. Carpus with distal and proximal spines on extensor margin, otherwise unarmed.

Cheliped: Stout; 2.5–4.2 [3.7] × as long as carapace (pcl); surface strongly setose. Ischium with dorsal and ventromesial spines distally and with row of spinules on ventral surface. Merus covered with setiferous tubercles and scattered spines along mesial surface, more pronounced in larger specimens; with two ventral spines distally. Carpus sparsely covered with setiferous tubercles; with two ventral spines; length [0.8]–1.0 × that of palm. Palm 1.5–2.2 [1.8] × as long as broad; unarmed. Dactylus 0.5–0.9 [0.7] × as long as propodus; occlusal margins denticulate without gape.

Pereopods 2–4: Increasing in length posteriorly; surface setose. Merus dorsal margin unarmed; ventral margin without spines, acuminate distally; 1.1–0.7 × as long as propodus (1.0–0.75 × in smallest specimen); P4 merus 0.8 × as long as P2 merus (0.9 × smallest specimen). Carpus unarmed. Propodus 3.1–3.6 × longer than wide (successively longer posteriorly); extensor margin smooth; flexor margin with only distal pair of spines, not inflated; 1.5–1.3 × as long as dactylus (from P2–4, 2.4–2.0 × in smallest specimen). Dactylus nearly straight; P4 dactylus shorter than P4 merus, about 1.4 × longer than P2 dactylus; flexor margin with 4–15 loosely and regularly arranged, inclined spines along entire length or along the distal 3/4 (P2 with fewer spines than P3–4), (5–9 on P2, 7–14 on P4, [8, 10, 11 on P2, P3 and P4 of holotype, respectively]), all sharp triangular; ultimate spine distinctly smaller than penultimate spine, subequal in width to antepenultimate but much longer; penultimate twice as broad as antepenultimate.

Ovum. Up to 62 eggs (NIWA 53582), 1.4–1.8 mm diameter. When larger eggs were noted (up to 1.8 mm diameter), the number was reduced to eight (NIWA 54081) and five (NIWA 54125), which occupied the entire sterno-abdominal cavity. In the latter case, the eggs were clearly late-stage, and newly hatched larvae were preserved in the sample as well.

Colour in life. A live specimen from the Chatham Rise (NIWA 53582) had a base orange colour, which was paler posteriorly and gradually dark orange anteriorly and on the chelipeds (Fig. 46). Other notes in specimen jars include 'small orange specimen' (NIWA 88746) and 'warm pink' for a specimen from Taiaroa Head (NMNZ CR.025219).

Etymology. Named in memory of Jaelan Rīwai Rāwiri Bell (1998–2014), and with gratitude for the friendship of his father Aaron Bell.

Remarks. *Uroptychus belli* **sp. nov.** is one of the most abundant species in New Zealand waters, with nearly 220 specimens in the collections, distributed around the southern regions of the continental shelf from the Bay of Plenty and the Challenger Plateau to the Campbell Rise (Fig. 50). Of the 150 specimens measured and sexed, two-thirds were female and 47% of the total were ovigerous. Only 34% of the samples examined in detail were males. The size ranged from a pcl 1.9 mm (female NIWA 92059) to 8.6 mm (female NIWA 54274) and morphometric variation related to size is observed as follows:

- the carapace length-width proportion is linear and increases at around the same rate for both males and females (Fig. 48A). The ovigerous females (≥ 4.2 mm pcl) tend to be the largest;
- the rostral proportion generally decreases with carapace length, with the largest specimens having a distinctly shorter rostrum in proportion to the remaining carapace length (Fig. 48B, also compare the large and small females in Fig. 49);
- the increase in total cheliped length is typically allometric and the rate of increase in males is steeper than that of females (Fig. 48C). The trendline for ovigerous females (not shown) is intermediate;
- correspondingly, the cheliped palm also varies allometrically and is typically more massive in larger males of this genus, a trend that is also apparent in this species (Fig. 48D). The rate of increase of palm width compared to palm length is distinctly higher in males than females. The trendline for ovigerous females (not shown) is intermediate;
- the number of spines along the flexor margin of the P2–4 dactyli varied greatly with size from four (the smallest specimen, NIWA 92059) to 15 in one of the largest specimens (e.g. NIWA 53582, ov. female, pcl 7.0 mm). However, the fact that the number of spines and the dactylar length increases markedly from P2 to P4, which is atypical, is diagnostic. For example, in the smallest specimen (NIWA 92059), the number of spines from P2–4 is 4, 5, 6, the large ovigerous female figured (NIWA 53582) has 10, 14, 15, the largest specimen (pcl 8.6 mm, NIWA 54274) has 10, 14, 14, and the holotype has 9, 11, 12 (Fig. 47M, N). Compared to the second walking leg (P2), the third (P3) and fourth

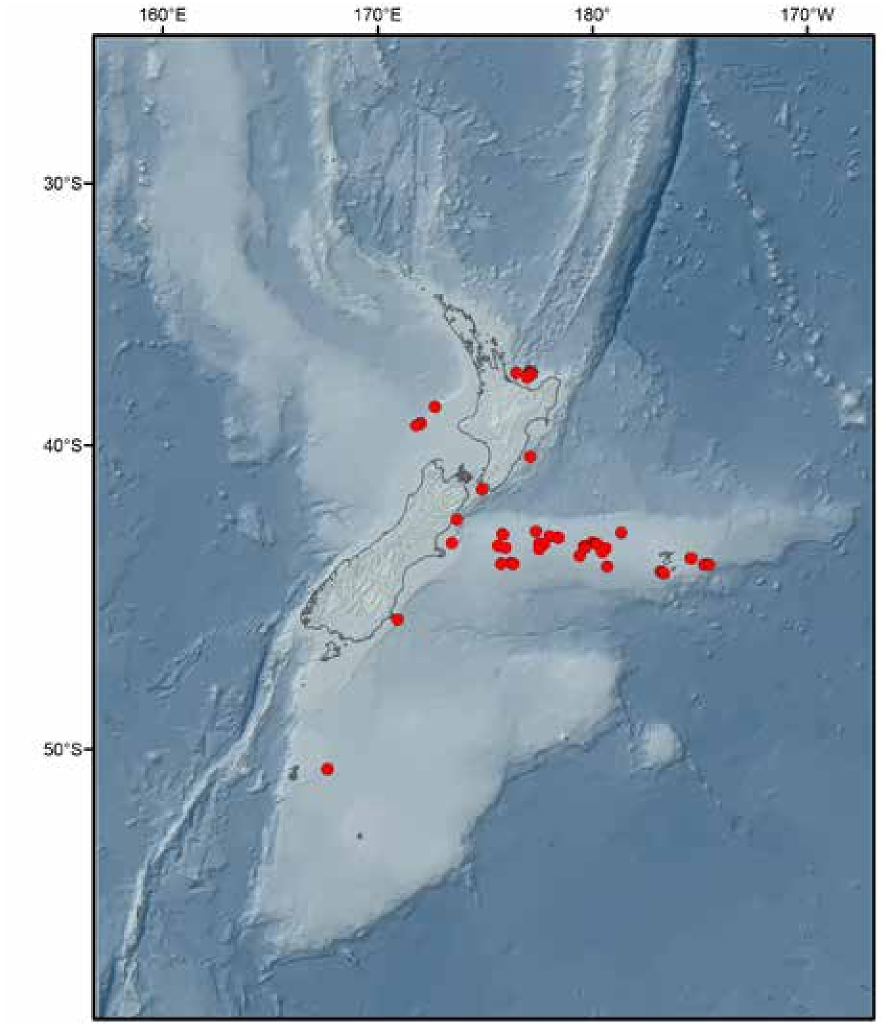


Figure 50. Distribution of *Uroptychus belli* **sp. nov.** around New Zealand.

(P4) will have a longer portion of the flexor margin covered with spines accommodating the increased number of spines, i.e. the entire margin compared to about ¾ of the margin in P2. The length of the dactyli, however, also increases posteriorly by about 20%. The dactylus-propodus length ratio between the P2 and P4 ranges from 0.4:0.6 (NIWA 92059 pcl 1.9 mm) to 0.7:0.9 (NIWA 53582, pcl 7.0 mm), and it appears that the relative dactylar length also increases with increasing body length;

- the number of spines along the lateral carapace margin appears to vary little with size: the lateral hepatic region typically bears one or two small granules (although these may be miniscule or absent in the smallest specimens), the first lateral branchial spine is most pronounced, slightly raised and set a little mesially towards the midline compared to the other branchial spines. The remaining 5 or 6 branchial spines are regularly arranged and appear less pronounced as the body size increases;
- dorsally, the carapace always has a few granules, spines, or setiferous ridges scattered around the hepatic and a transverse row across the epigastric region, sometimes more pronounced in large specimens;
- the rostrum spination varies, with most specimens bearing a distinct pair of subapical spines in the distalmost portion of the rostrum. May be less distinct and instead a specimen may bear a row of serrations, the rostrum is never smooth;
- the pterygostomian flap is well-ornamented with small spines in both the anterior and posterior portion. While the size and distribution of the spines may vary, the anterior portion appears to always have a median row of spines more or less regularly arranged and typically also clearly visible when the specimen is viewed dorsally;
- the antennal scale ranges from not reaching the distal end of the peduncle (e.g. NIWA 23382) to slightly overreaching the peduncle (e.g. NIWA 92059). The holotype has the left scale not reaching and right scale just reaching the end of the peduncle (Fig 47E). Additionally, the degree to which the distal spine on article 5 of the antennal peduncle is pronounced varies from a distinct small spines (typically) to a minute or obsolescent and barely visible spine (e.g. female, NIWA 54081, pcl 4.4 mm). The spine is distinct in the majority of specimens.

Based on the presence of lateral spines along the carapace and spines on the antennal peduncle and maxilliped, the antennal scale reaching or just overreaching the peduncle, the sternite 3 with a median notch and the distal spines of the P2–4 dactyli being distinctly smaller than the penultimate spine, *U. belli* **sp. nov.** most closely aligns with *U. tridentatus* (Henderson, 1885) from the central western Pacific, *U. annae* Baba, 2018 from a range of southwestern Pacific islands including New Zealand, but also *U. cardus* Ahyong & Poore, 2004 from Tasmania and New Zealand. *Uroptychus belli* **sp. nov.** can be distinguished from all of these by the following characters: the P2–4 propodi bear a distal pair of spines, and no other spines along the flexor margin (the other species have at least one spine on P2 or P3, *U. annae* may not have any spines on the flexor margin of P4). The length of the dactyli increases markedly from P2 to P4, with the number of spines increasing as well. The number of spines is typically 8–10 on P2 increasing to 11–13 on P4. The length of the dactyli does not increase in the other species and *U. annae* bears six spines and *U. tridentatus* eight or nine spines on the dactyli. *Uroptychus cardus* bears more spines (16–20) along all walking legs. *Uroptychus belli* **sp. nov.** bears more spines on the cheliped than both *U. annae* and *U. tridentatus*, both mesially on the merus and distally on merus and carpus, and less spines than *U. cardus* (the surface of the merus is unarmed in *U. belli* **sp. nov.**, distinctly spinose in *U. cardus*) and *U. cardus* bears a distinct epigastric field of spines and granules, while *U. belli* **sp. nov.** may have a few scattered small granules or obsolescent spines.

In the key to New Zealand *Uroptychus*, *U. belli* **sp. nov.** aligns with *U. tasmani* **sp. nov.**; differences are discussed under that species, below.

DNA sequence data. Intraspecific sequence divergence for partial CO1 gene: 1.9–2.9% (NIWA 105942, 53603, 88746), around 4% for NIWA 76455. A closer investigation of the population genetics of this species might uncover some further subdivisions which so far remain cryptic.

ZooBank registration. *Uroptychus belli* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:524900D2-3BEC-42D6-BFF1-4932B3385371.

Uroptychus belos Ahyong & Poore, 2004

Figs 51, 52

Uroptychus belos Ahyong & Poore, 2004: 25, fig. 5; Baba 2005: 224 (synonymies, key); Baba *et al.* 2008: 28 (list and synonymies); Baba 2018: 94, fig. 31.

Type & locality (not examined). Holotype—AM P65830, Tasman Sea, 28°17.47´S, 158°37.89´E, 419 m, female (cl 5.4 mm).

Material examined. *West Norfolk Ridge (International Waters)*: NMNZ CR.022682, NORFANZ Stn TAN0308/100, 33°46.80′S, 167°19.26′E, 280–265 m, 28 May 2003, 1 male (5.3 mm, pcl 3.4 mm; sequenced, see Fig. 5).

Distribution. Britannia Seamount, SE of Brisbane, Tasman Sea, Norfolk Ridge, Chesterfield Islands, New Caledonia, 366–560 m; West Norfolk Ridge, 265–280 m (Fig. 52).

Habitat. Unknown.

Diagnosis. Carapace slightly wider than long; dorsally unarmed; anterolateral spine distinctly larger than lateral orbital spine; lateral margin with four strong spines posterior to anterolateral spine (additional small posterior spine may be present). Rostrum narrow triangular, breadth less than half distance between anterolateral spines. Thoracic sternite 3 anterolaterally rounded; anterior margin shallow concave, with median notch but without submedian spines. Sternite 4 posterolateral margin shorter than anterolateral. Antennal scale falling short of end of peduncle; peduncle with small distal spine on articles 4 and 5. P 2–4 similar; meri and carpi unarmed; propodi not broadened distally, with distal pair of spines on flexor margin only; dactyli distally narrowed, with 7–10 narrow triangular inclined spines along distal two-thirds of flexor margin; penultimate spine much broader (> 2 ×) than both ultimate and antepenultimate.

Colour in life. Not known.

Remarks. The incomplete specimen of *U. belos* matches the description by Ahyong & Poore (2004, Fig. 51) and subsequent records by Baba (2018) in most parts. Small differences are as follows:

- the carapace is nearly as long as broad (length 0.9 × width). Ahyong & Poore (2004: 25) state 'breadth greater than length' and Baba (2018: 94) includes 'distinctly broader than long (0.8 × as long as broad)';
- the lateral orbital spine is strong in the specimen examined, being subequal to the anterolateral spine, but it appears smaller in both Ahyong & Poore (2004) and Baba (2018);
- a single minute lateral spine is present on the left hepatic region but absent on the right. No lateral hepatic spines were noted in Ahyong & Poore (2004) and Baba (2018);
- the specimen bears an additional small lateral spine posteriorly, much smaller than the strong four branchial spines that match the previous illustrations in number and shape.

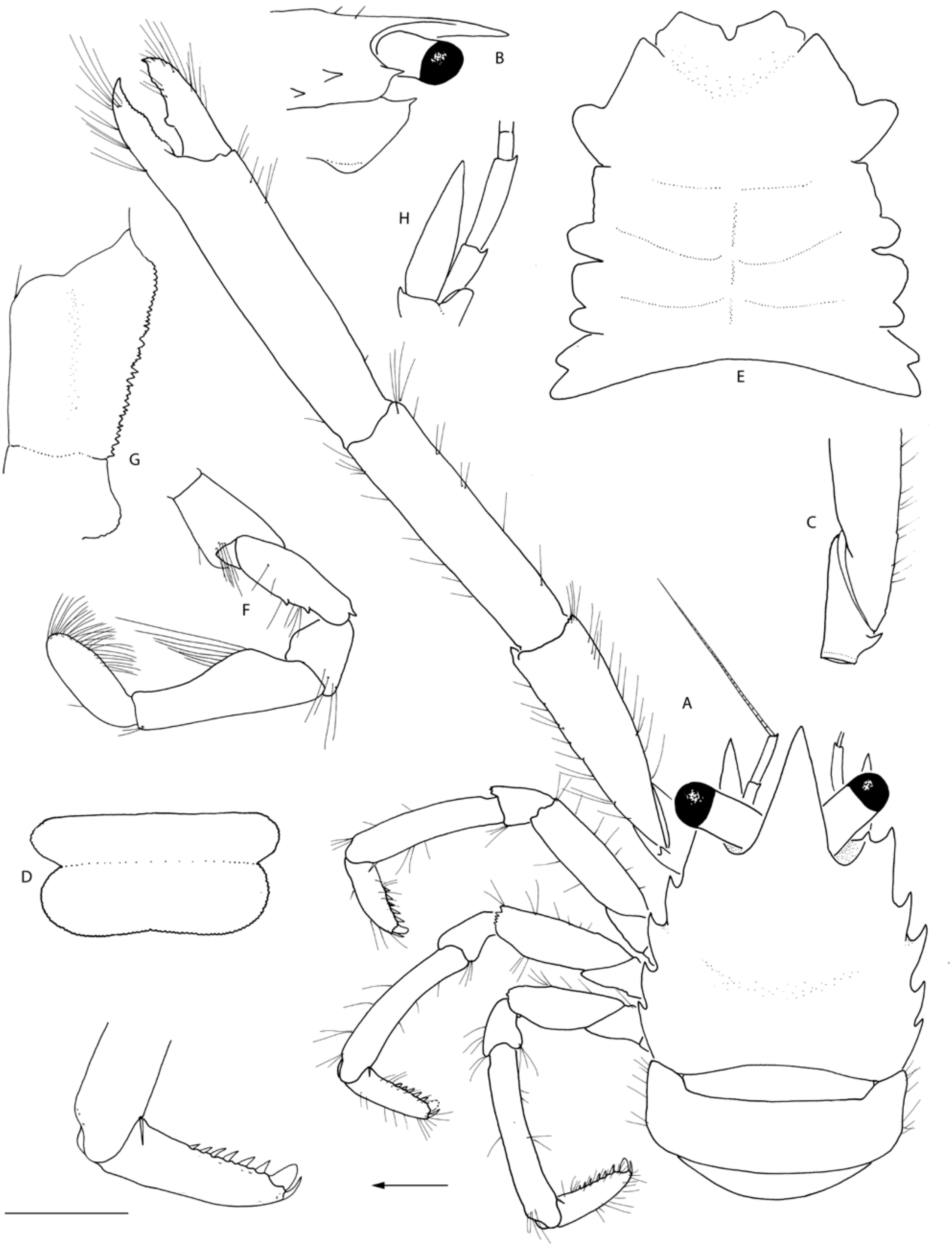
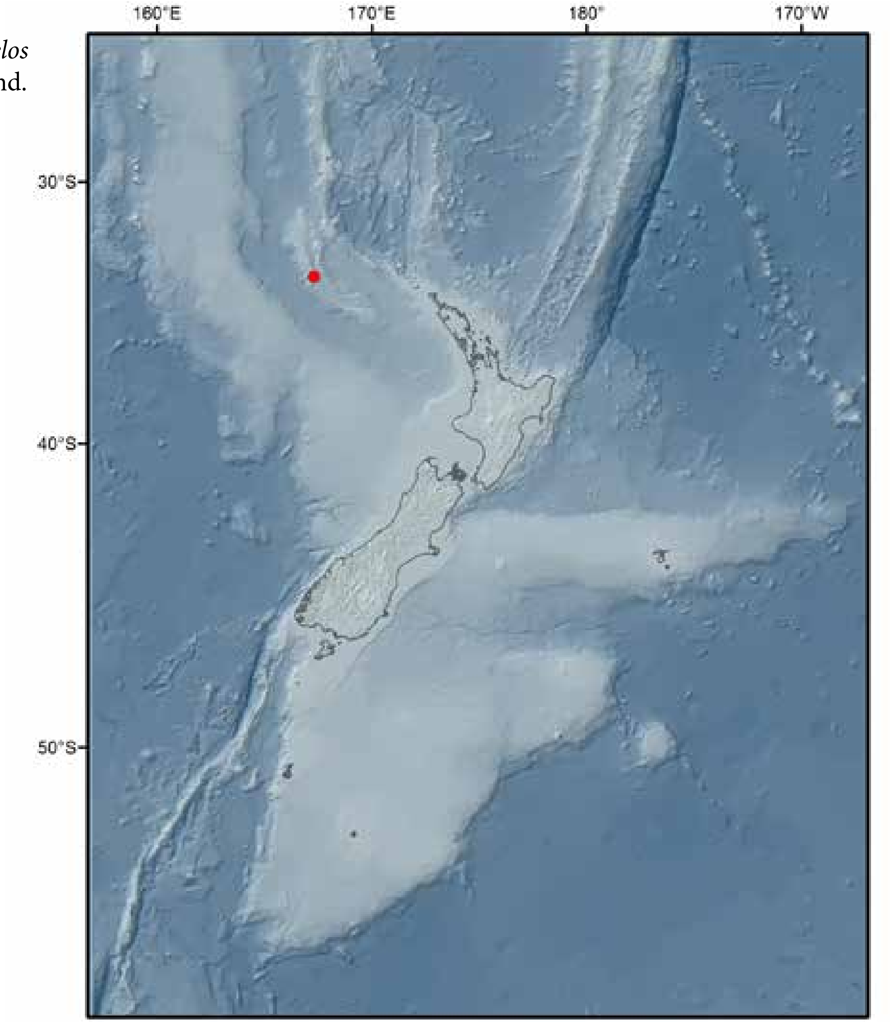


Figure 51. *Uroptychus belos* Ahyong & Poore, 2004, holotype female, AM P65830: **A.** dorsal habitus; **B.** anterior carapace, right lateral; **C.** cheliped, proximal articles, left lateral; **D.** telson; **E.** sternal plastron; **F.** Mxp3, right lateral; **G.** crista dentata, right; **H.** antenna, right ventral. Scale A–C = 2 mm, D–F, H = 1 mm, G = 0.5 mm. After Ahyong & Poore (2004).

Figure 52. Distribution of *Uroptychus belos* Ahyong & Poore, 2004 around New Zealand.



The irregular distal margin of the meri of P2–4 appears to be distinct and is illustrated but not commented on in Ahyong & Poore (2004).

In New Zealand, *U. belos* is most similar to *U. bathamae* **sp. nov.**, *U. leptus* **sp. nov.,** and *U. tasmani* **sp. nov.**, with which it shares a small size, distinct spines along the lateral carapace margin, only a distal pair of spines on the P2–4 propodi and the armature of P2–4 dactyli. *Uroptychus bathamae* **sp. nov.** and *U. tasmani* **sp. nov.**, however, bear spines on the anterior dorsal carapace surface (at least the lateral gastric and hepatic regions), which is unarmed in *U. belos* and *U. leptus* **sp. nov.** Both species also have more lateral branchial spines (typically six spines); *U. belos* only has four and *U. leptus* **sp. nov.** has three. The antennal scale falls short of the peduncle in *U. belos* while it distinctly overreaches the distal end of the peduncle in the other species; and the sternal shape varies, e.g. the sternite 3 anterior margin is shallow excavated with a small median notch and laterally rounded in *U. belos*, while in the other species the sternite 3 is anterolaterally distinctly acute, with a notch flanked by submedian spines, and the sternite 3 anterior margin is more deeply excavated.

This New Zealand record is the most southern for this species at just over 33°S and the shallowest at 265 m.

Uroptychus bicavus Baba & de Saint Laurent, 1992 Figs 53, 54

Uroptychus bicavus Baba & de Saint Laurent, 1992: 323, fig. 1; Chevaldonné & Olu 1996: 293 (no record); Baba 2005: 224 (synonymies, key); Baba *et al.* 2008: 28 (list and synonymies); Schnabel 2009b: 26 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list); Baba 2018: 35 (key).

Type & locality (not examined). Holotype—MNHN-IU-2019-2560 (MNHN Ga-2350), 18°50´S, 173°29´W, North Fiji Basin, active thermal vent, 2750 m, male (pcl 7.5 mm).

Material examined. *South Norfolk Basin*: NIWA 18581, NZOI Stn U576, 32°14.50′S, 170°14.20′E, 2340 m, 4 Feb 1988, 1 male (12.9 mm, pcl 9.0 mm).

Distribution. North Fiji Basin, active thermal vent, Lau Back-Arc Basin; South Norfolk Basin; 2340–2750 m (Fig. 54).

Habitat. *Uroptychus bicavus* was described from the “White Lady” active hydrothermal vent east of Tonga at 2750 m. More recently, in his key to species of

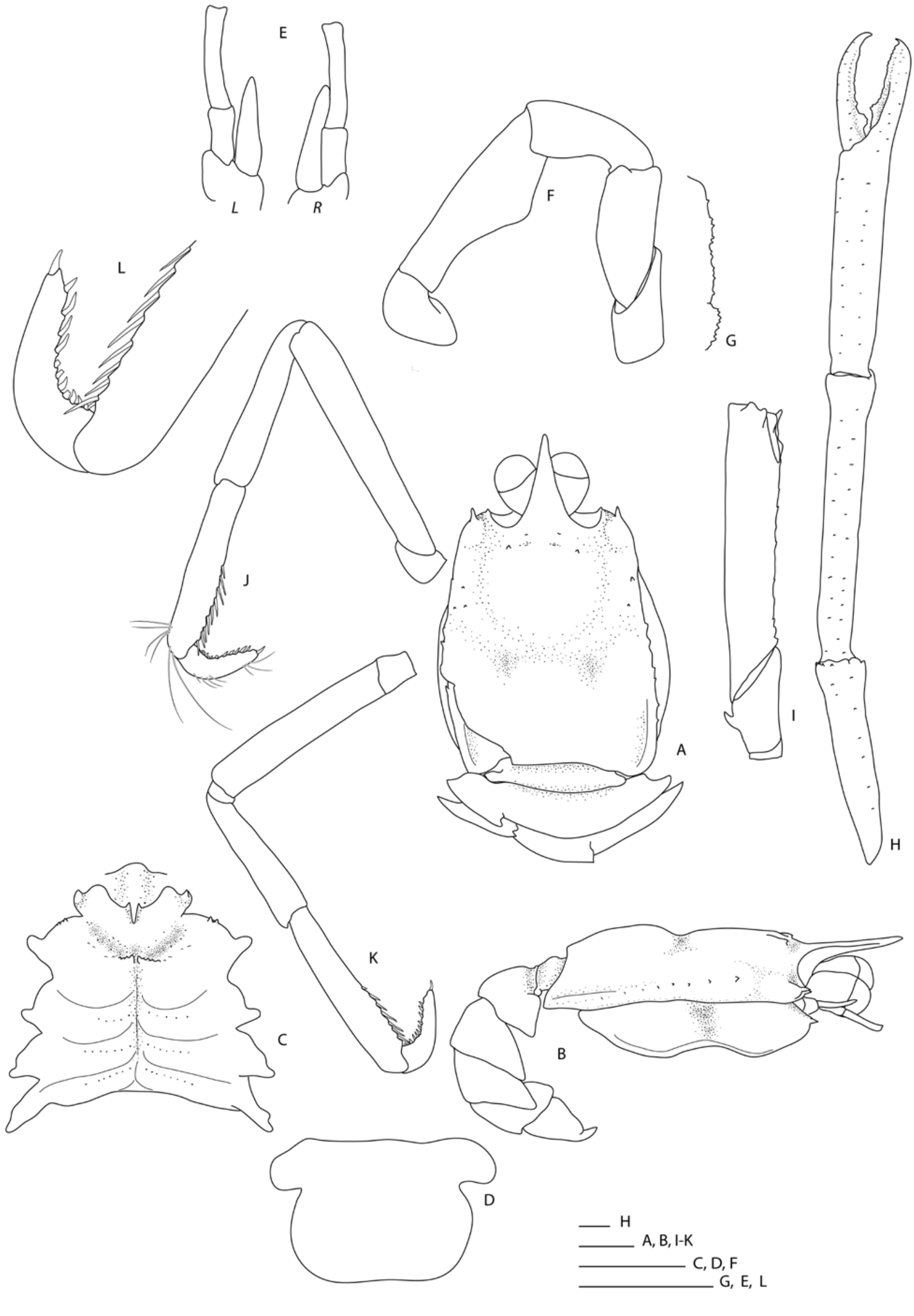
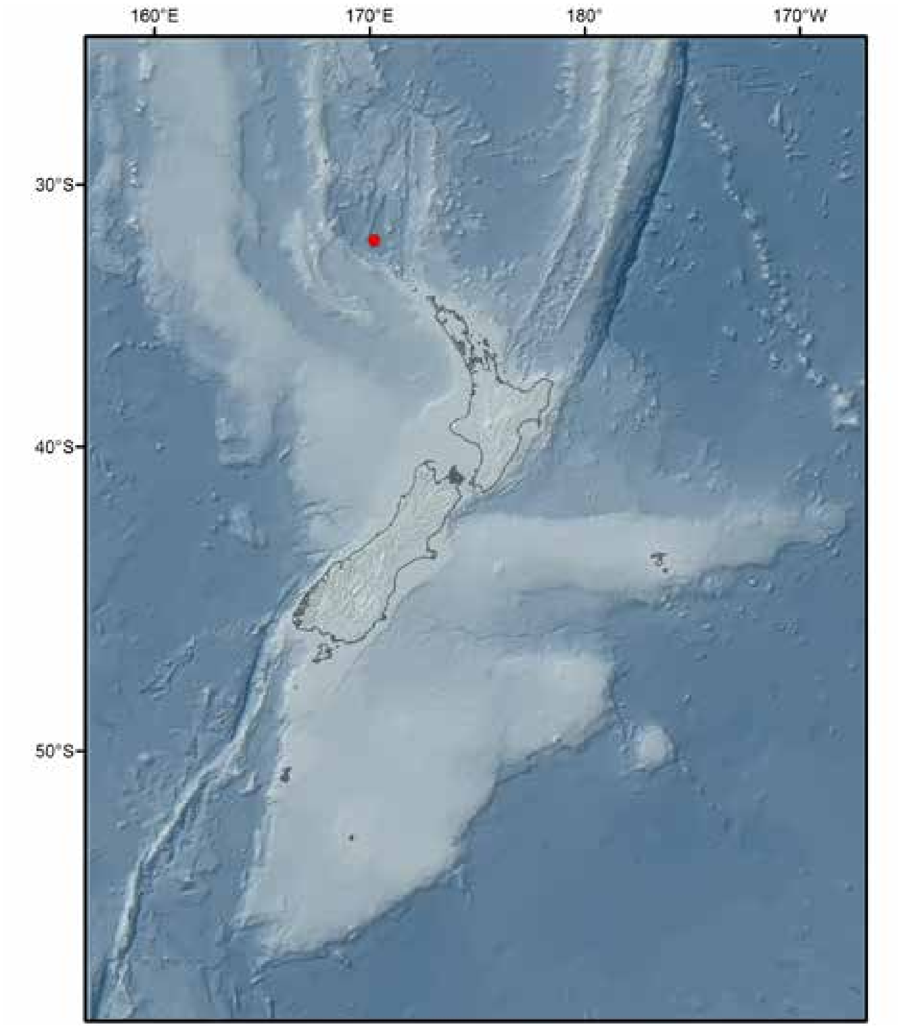


Figure 53. *Uroptychus bivacus* Baba and de Saint Laurent, 1992, male, NIWA 18581: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of right Mxp3; **H.** right cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J**, **K.** left pereopods 2 and 4; **L.** distal portion of propodus and dactylus, right P4, lateral. Scale bars = 2 mm.

Figure 54. Distribution of *Uroptychus bicavus* Baba and de Saint Laurent, 1992 around New Zealand.



Uroptychus, Baba (2018) noted an additional specimen (MNHN) (from the Lau Back-Arc Basin, collected at 2668 m). This habitat association does not appear to apply to the New Zealand specimen. It was collected on a small conical feature in the central South Norfolk Basin (approximately 2200 km from the type locality); there was no indication of any recent hydrothermal activity in the area (R. Wysoczanski., pers. comm.).

Uroptychus bicavus is the deepest recorded chirostylid (2340–2750 m). Few chirostylids have ever been reported from below 2000 m: *U. remotispinatus* from 2175–2250 m (Baba 2018), *U. thermalis* from 2100–2110 m (Baba 2018), *Heteroptychus lemaitrei* from 2084 m (Baba 2018), and *U. bispinatus* from 2013 m (Baba 1988).

Diagnosis. Carapace longer than broad, dorsally slightly rugose, gastric and cardiac carapace regions distinctly inflated, small epigastric spines or tubercles, scattered small tubercles in anterior half, distinct paired median depression across level of cervical groove; lateral margin irregular but without distinct spine, other than anterolateral spine. Rostrum narrow triangular. Sternite 3 anterior margin with median notch and submedian spines; sternite 4 not produced anteriorly; sternite 5 with distinctly convex anterolateral margin. Antennal article 2 and articles 4 and 5 unarmed; antennal scale barely reaching midlength of antennal article 5. Cheliped long and slender, 6 × pcl, ischium unarmed ventrally. P2 merus as long as pcl; P2–4 propodi subequal in length to carpi, with 7 or 8 movable spines in addition to distal pair. P2–4 dactyli distally narrowed, with 10–13 obliquely directed, loosely arranged, sharp triangular spines along flexor margin, distal group of spines subequal in size, penultimate spine equidistant between ultimate and antepenultimate.

Colour in life. Not known.

Remarks. This new, incomplete specimen matches the original description (Baba & de Saint Laurent 1992), notably the gastric and cardiac carapace regions that are distinctly inflated with paired deep excavations in the anterior cardiac region, the antennal scale reduced and the rounded anterolateral margins of the sternite 4.

The original account of *U. bicavus* is brief, but additional characters can be added. The excavated sternum is anteriorly rounded and with a low ridge along the midline, and the anterolateral margin of sternite 4 is about as long as the posterolateral margin. The telson is 1.6 × as wide as long, with the posterior

Figure 55. *Uroptychus bispinatus* Baba, 1988, male, pcl 3.1 mm, NIWA 72233, on *Chrysogorgia* coral. Collected from the south cone of Clark Seamount between 1456–1460 m. Image courtesy of Rob Stewart, NIWA.

portion about twice as long as the anterior, the distal margin nearly straight. All pereopods are very long, with the cheliped 5–6 × pcl (holotype and NIWA specimen, respectively) and the merus of P2 as long as the pcl. Also, at least the P2 carpus is nearly as long as the propodus (the P4 carpus examined here is slightly shorter). The cheliped ischium bears a strong dorsodistal spine but the ventral margin is entirely smooth.

Minor differences from the holotype are noted as follows (Fig. 53): the carapace is slightly wider with a length-width ratio of 1.1 compared to 1.2 for the holotype; the anterior sternite 3 here has a distinct median notch flanked by a pair of simple submedian spines (indistinct in holotype), the anterior margin is distinctly rounded and lobed (angular with small tubercles in holotype), and the lateral margins are produced to a distinct tooth (indistinct in holotype). The walking leg dactyli have more spines (12 and 13 compared to 10) on the dactyli of the slightly smaller holotype.

Species that share key morphological characters with *U. bicavus* include *U. politus* (Henderson, 1885), which has an entirely smooth carapace (rugose in *U. bicavus*), *U. nieli* **sp. nov.**, which has a prominent spine along the lateral carapace margin (unarmed in *U. bicavus*), and the group of species united in the key (*U. maori* Baba, 1974, *U. nirvana* **sp. nov.**, *U. empheres* Ahyong & Poore, 2004, *U. inermis* Baba, 2018, *U. litosus* Ahyong & Poore, 2004, and *U. aotearoa* **sp. nov.**). *Uroptychus bicavus* differs from each of these in that it has proportionately longer walking legs, with the P2 merus as long as pcl and the P2–4 carpi nearly as long as propodi. The P2–4 meri of *U. bicavus* are much shorter (distinctly shorter than the pcl and fully or barely equal to two-thirds the length of the propodi) in these allies.

Uroptychus bispinatus Baba, 1988

Front cover, Figs 55–57

Uroptychus bispinatus Baba, 1988: 25, fig. 9; Baba 2005: 224 (synonymies, key); Baba *et al.* 2008: 29 (list and synonymies); Baba *et al.* 2009: 40, figs 32–33; Poore *et al.* 2011: 328, plate 6E; Baba 2018: 107, fig. 38.

Material examined. Holotype—USNM 150311, RV *Albatross* Stn 5614, 0°31′N, 125°58.75′E, Moluccas, between Halmahera and North Sulawesi, 2013 m, 22 Nov 1909, 1 female (8.2 mm, pcl 6.1 mm).

Other material. *Southern Kermadec Ridge*, *Rumble II West seamount*: NIWA 69785, NIWA Stn TAN1007/118, 35°21.86–21.79′S, 178°31.5–31.24′E, 1280–1380 m, 08 Jun 2010, 1 female (6.2 mm, 5.0 mm pcl).

Bay of Plenty: NIWA 72233, NIWA Stn TAN1104/19,

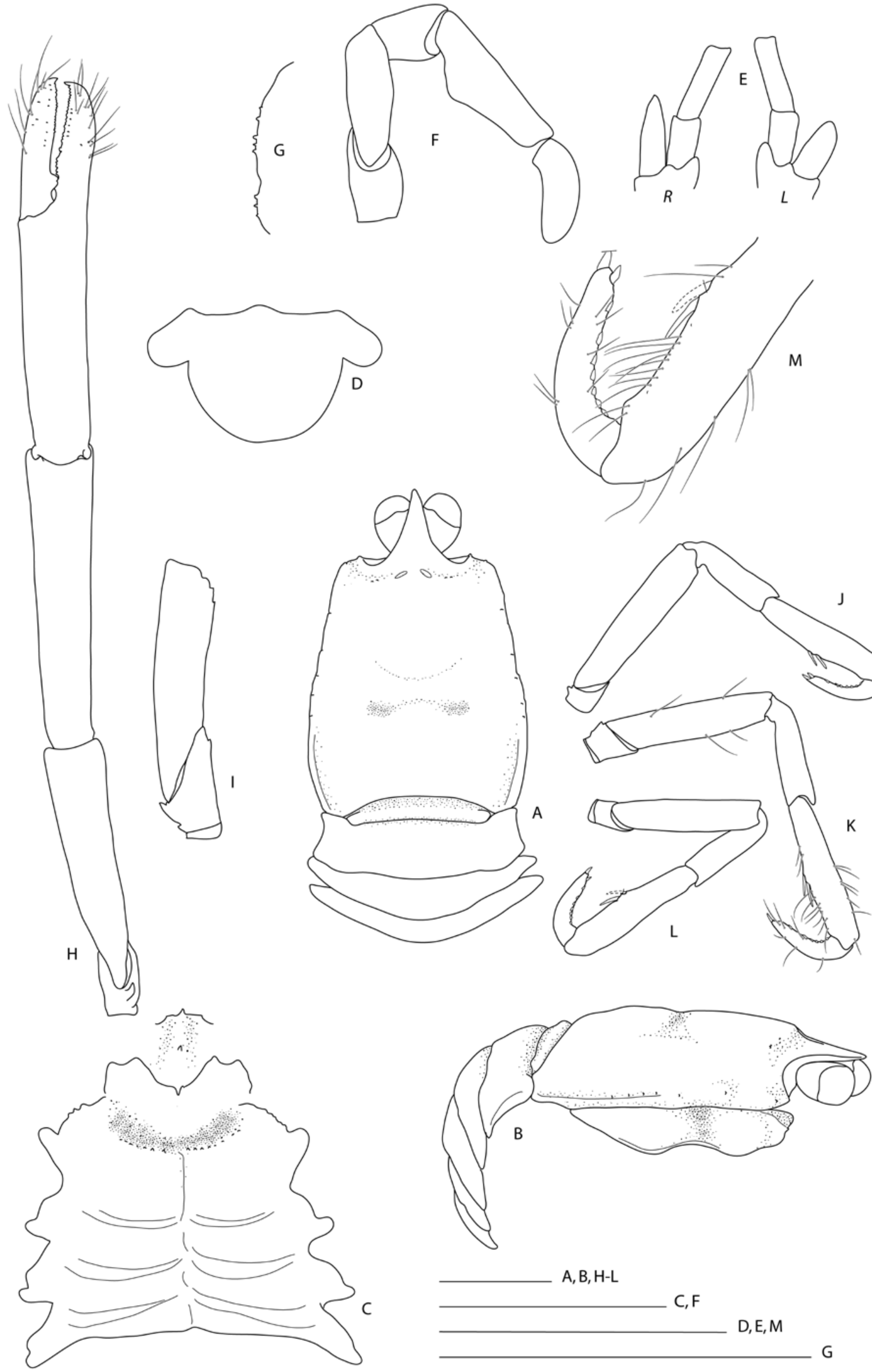
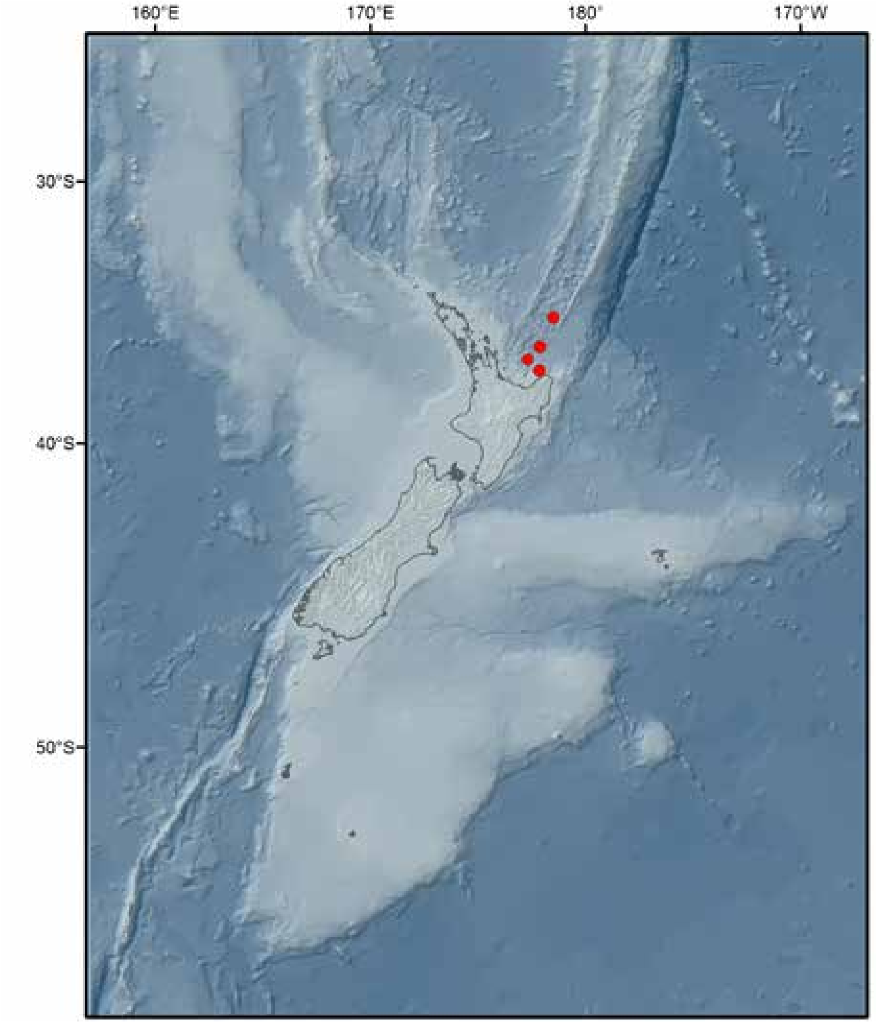


Figure 56. *Uroptychus bispinatus* Baba, 1988, male, NIWA 9013: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of left Mxp3; **H.** right cheliped, dorsal; **I.** left cheliped ischiomerus, proximal articles, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, P4, lateral. Scale bars = 2 mm.

Figure 57. Distribution of *Uroptychus bispinatus* Baba, 1988 around New Zealand.



Clark Seamount, 36°28.57–28.37′S, 177°53.51–53.43′E, 1456–1460 m, 3 Mar 2011, 1 male (4.1 mm, pcl 3.1 mm; sequenced, see Fig. 5), "with small *Chrysogorgia*"; NIWA 9013, NIWA Stn TAN0413/35, 36°57.57–57.69′S, 177°19.92–19.54′E, Otara Knoll, 1396–1462 m, 9 Nov 2004, 1 male (5.2 mm, pcl 3.9 mm); NIWA 123240, NIWA Stn TAN1206/68, 37°21.91–21.84′S, 177°52.73–52.44′E, 1229–1250 m, 21 Apr 2012, 1 female (4.6 mm, pcl 3.5 mm), "on *Chrysogorgia* sp. nov." (C. Untiedt pers. comm.).

Type locality. Moluccas, between Halmahera and North Sulawesi, 2013 m.

Distribution. Molucca Sea, Taiwan, Fiji, 1173–2013; southern Kermadec Ridge and Bay of Plenty, New Zealand, 1229–1462 m (Fig. 57).

Habitat. Taken from bottom of mud, sand, and globigerina (Baba 1988). The New Zealand specimens were all collected on seamounts, and anecdotal evidence points to an association with chrysogorgiid corals. One female (NIWA 123240) was extracted from the matrix of a small colony of an undescribed species of *Chrysogorgia* (C. Untiedt pers. comm.), one male (NIWA 72233) was photographed live clinging to the branches of a small *Chrysogorgia* sp. (Fig. 55), and chrysogorgiids have been collected at the other two stations where *U. bispinatus* has been recorded (as have been other larger gorgonians, isidids and branching hard corals).

Diagnosis. Dorsal surface of carapace and abdomen unarmed. Carapace lateral margin without distinct spine, indistinct anterolateral spine. Lateral orbital spine indistinct. Rostrum narrow triangular. Antennal peduncle unarmed, antennal scale short, barely reaching or overreaching article 4. Anterolateral margin of sternite 4 about as long as posterolateral margin. Cheliped entirely unarmed except for dorsal spine on ischium; fingers distally spooned. P2–4 propodi with two spines only on middle portion of flexor margin; dactyli distally narrowed; with antepenultimate spine situated slightly remote from both penultimate and from proximal row of spines, spines oriented parallel to flexor margin.

Colour in life. Baba *et al.* (2009) and Poore *et al.* (2011) present a photo of a male from Taiwan with the following comments: "pale pink overall. Anterior carapace and Mxp3 reddish pink. Corneas pale orange, Abdomen translucent". The male (NIWA 72233) collected from a gold coral on Clark seamount appeared paler, with the body pale purple, the anterior margin of carapace and the tips of P1–4 a deeper pink, ocular peduncle orange-pink, cornea mesially orange but otherwise unpigmented (Fig. 55).

Remarks. Originally described from the Molucca Sea (Baba 1988), Baba *et al.* (2009) reported one specimen of *U. bispinatus* from Taiwan, and Baba (2018) recently added five specimens from one station in Fiji (1216–1226 m). This is the fourth record for this species with four specimens collected from three separate seamounts and a canyon along the southern Kermadec Ridge and Bay of Plenty (Fig. 57).

Uroptychus bispinatus is a distinctive species, with only two spines at approximately the midlength of the P2–4 propodi, and an unarmed distalmost angle, which is atypical in the genus. The combination of the distinct arrangement of spines along the flexor margin of the dactyli in addition to the short antennal scale, the nearly obsolescent spines at the anterolateral shoulder and the semircular telson without the more typical distal emargination, is also diagnostic.

The Fiji specimens of Baba (2018) lack a median spine on the excavated sternum as in the type, but instead have a smooth longitudinal ridge (shared with specimens presented from Taiwan in Baba *et al.* (2009)). The specimens examined here align closely with the holotype in having a clear median tubercle and being only weakly ridged longitudinally (Fig. 56C).

The morphology of the P2–4 pereopod aligns *U. bispinatus* closely with *U. albus* McCallum & Poore, 2013 from Western Australia. Based on a single specimen collected off Cape Leveque (924–1101 m), with most of the walking legs missing, *U. albus* has a rugose dorsal carapace surface (smooth in *U. bispinatus*), the rostrum falls short of the end of the ocular peduncle (reaches or overreaches the eyes in *U. bispinatus*), the cheliped ischium is entirely unarmed (dorsally bearing a small but distinct spine in *U. bispinatus*) and the P2 propodus bears three median spines in addition to a small distal spine (two or three median spines and unarmed distally in *U. bispinatus*).

Based on the armature of the walking leg dactyli (spines oriented parallel to the flexor margin), *U. bispinatus* is also aligned with *U. australis*, *U. brevisquamatus,* and *U. webberi*, which are all known from New Zealand. It differs from all of these in the morphology of the walking leg propodi, bearing two or three spines at the midlength rather than a row of spines along the distal half of the flexor margin.

Uroptychus bispinatus also resembles *U. remotispinatus* Baba & Tirmizi, 1979 in having a short rostrum and short antennal scale and in having the P2–4 propodi with the distal angle of the flexor margin unarmed. However, in *U. remotispinatus* the spines along the P2–4 dactyli are not inclined and the propodi bear a number of spines along a straight flexor margin while *U. bispinatus* has only two or three median spines along a slightly to distinctly inflated flexor margin.

A female from Rumble II West seamount (NIWA 69785) has a rhizocephalan externa under the abdomen.

DNA sequence data. Interspecific sequence divergence for partial CO1 gene: > 10% compared to all other species available.

Uroptychus brevisquamatus Baba, 1988

Figs 58–60

Uroptychus brevisquamatus Baba, 1988: 28, fig. 10; Baba 2005: 225 (synonymies, key); Baba *et al.* 2008: 29 (list and synonymies); Baba 2018: 124, figs 47, 48.

Material examined. Holotype—USNM 150319, RV *Albatross* Stn 5635, 1°53.50′S, 127°39.00′E, southeast of Gomu Island, off southern Obi, Halmahera Regency, North Muluku, Seram Sea, Indonesia, 732 m, 3 Dec 1909, female ov. (11.2 mm, pcl 8.8 mm).

Other material. *Macauley Island*, *Kermadec Islands*: AKM MA124689 (ex NIWA 115196), Kermadec-Rangitahua Stn TAN1612/79, 30°15.53–15.80′S, 178°14.88–15.06′W, 982–978 m, 29 Oct 2016, 1 female (10.8 mm, pcl 8.5 mm; sequenced, see Fig. 5).

Havre Volcano, *Kermadec Ridge*: NIWA 24586, NIRVANA Stn TAN1213/39, 31°6.25–6.11′S, 179°5.97′W, 1022–1034 m, 20 Oct 2012, 1 female (rostrum damaged, pcl 12.0 mm; sequenced, see Fig. 5).

Maria Ridge, *off North Cape*: NIWA 123241, NIWA Stn TAN1312/D7-d81, 33°42.21′S, 171°43.74′E, 932–837 m, 15 Nov 2013, 1 male (6.4 mm, pcl 4.6 mm), extracted from *Chrysogorgia chryseis*; NIWA 103477, NIWA Stn TAN1312/D5-d75, 34°07.09′S, 171°12.82′E, 1125–1060 m, 15 Nov 2013, 1 female (9.6 mm, pcl 7.2 mm; sequenced, see Fig. 5).

Southern Colville Ridge: NIWA 76189, NIWA Stn KAH9907/51, 36°30.37′S, 176°30.97′E, 920–1053 m, 5 Jun 1999, 1 male (7.6 mm, pcl 5.4 mm); NIWA 88552, NIWA Stn KAH9907/53, 36°30.27–29.69′S, 176°30.45–29.86′E, 990–1100 m, 5 Jun 1999, 1 male (10.3 mm, pcl 7.7 mm), 1 female (7.6 mm, pcl 5.4 mm).

Southern Kermadec Ridge, *Whakatane Seamount*: NIWA 82666, NIWA Stn TAN1206/77, 36°48.63–48.79′S, 177°27.92–28.03′E, 878–911 m, 22 Apr 2012, 1 female (11.3 mm, pcl 8.3 mm).

Bay of Plenty, *Matatara Knoll*: NIWA 24579, NIWA Stn TAN1206/168, 37°11.22–11.20′S, 176°58.70–58.48′E, 948–930 m, 30 Apr 2012, 1 female (4.6 mm, pcl 3.5 mm; sequenced, see Fig. 5).

No locality information: NMNZ CR.019807, RV

Figure 58. *Uroptychus brevisquamatus* Baba, 1988, female, pcl 11.3 mm, NIWA 82666, Stn TAN1206/77, Whakatane Seamount, Bay of Plenty, 931–916 m. Image courtesy of Owen Anderson, NIWA.

Alexander Nesmeyanov 1990, 1 female ov. (11.2 mm, pcl 8.5 mm).

Type locality. Southeast of Gomu Island, off southern Obi, Halmahera Regency, North Muluku, Seram Sea, Indonesia, 732 m.

Distribution. Indonesia, Solomon Islands, Vanuatu, Wallis and Futuna Islands, Norfolk and Loyalty Ridge and now lower Norfolk, Colville and Kermadec Ridges, 700–1125 m (Fig. 60).

Habitat. Biological associations are unknown, Baba (1988) reported the type from a habitat that included coral. One male (NIWA 123241) was picked off a gold coral (*Chrysogorgia chryseis*).

Diagnosis. Carapace smooth on dorsal surface; about as long as broad (without rostrum). Carapace lateral margin without distinct spine, other than strong anterolateral spine. Lateral orbital spine absent or small. Rostrum narrow triangular. Ocular peduncle with mesial depression proximal to cornea. Antennal article 2 strongly produced at distolateral margin; antennal scale ending in or overreaching midlength of antennal article 5. P2–4 meri and carpi unarmed; propodi not broadened distally; with row of spines, distal-most spine single; dactyli distally narrowed, with row of regularly arranged spines, ultimate spine longer and subequal or slightly broader than penultimate, arranged parallel to flexor margin.

Colour in life. Dark orange in anterior portion including the cheliped and walking legs, gradually changing to a pale colour from midlength of the carapace across abdomen (Fig. 58).

Remarks. *Uroptychus brevisquamatus* is easily recognisable by the combination of a convexly divergent posterior portion of the lateral carapace, strong anterolateral carapace spines, the short and wide antennal scale (reaching or just overreaching mid-length of the article 5 and being wider than the peduncle), the propodal flexor margin of the walking legs terminating in a single spine, and the small stout spines that are arranged parallel to the flexor margin of the walking leg dactyli and the concave mesial margin of the ocular peduncle proximal to the cornea (Baba 1988, 2018). The ten specimens examined here show slight variations; the lateral orbital spine is absent in specimens NIWA 82666, 24568 and 115196, similar to the holotype (Baba 1988: fig. 10), and the other specimens have a small orbital spine, similar to that illustrated in Baba (2018: 125, fig. 47). The rostrum appears slightly longer and more spiniform in some of the specimens than previously illustrated and distinctly overreaches the ocular peduncles; rostrum is about 1.5 × longer than wide in the figured female (NIWA 82666, Fig. 59) compared to 1.3 × (Baba 1988: fig. 10) and 1.1 × (Baba 2018: fig. 47). The anterior portion of thoracic

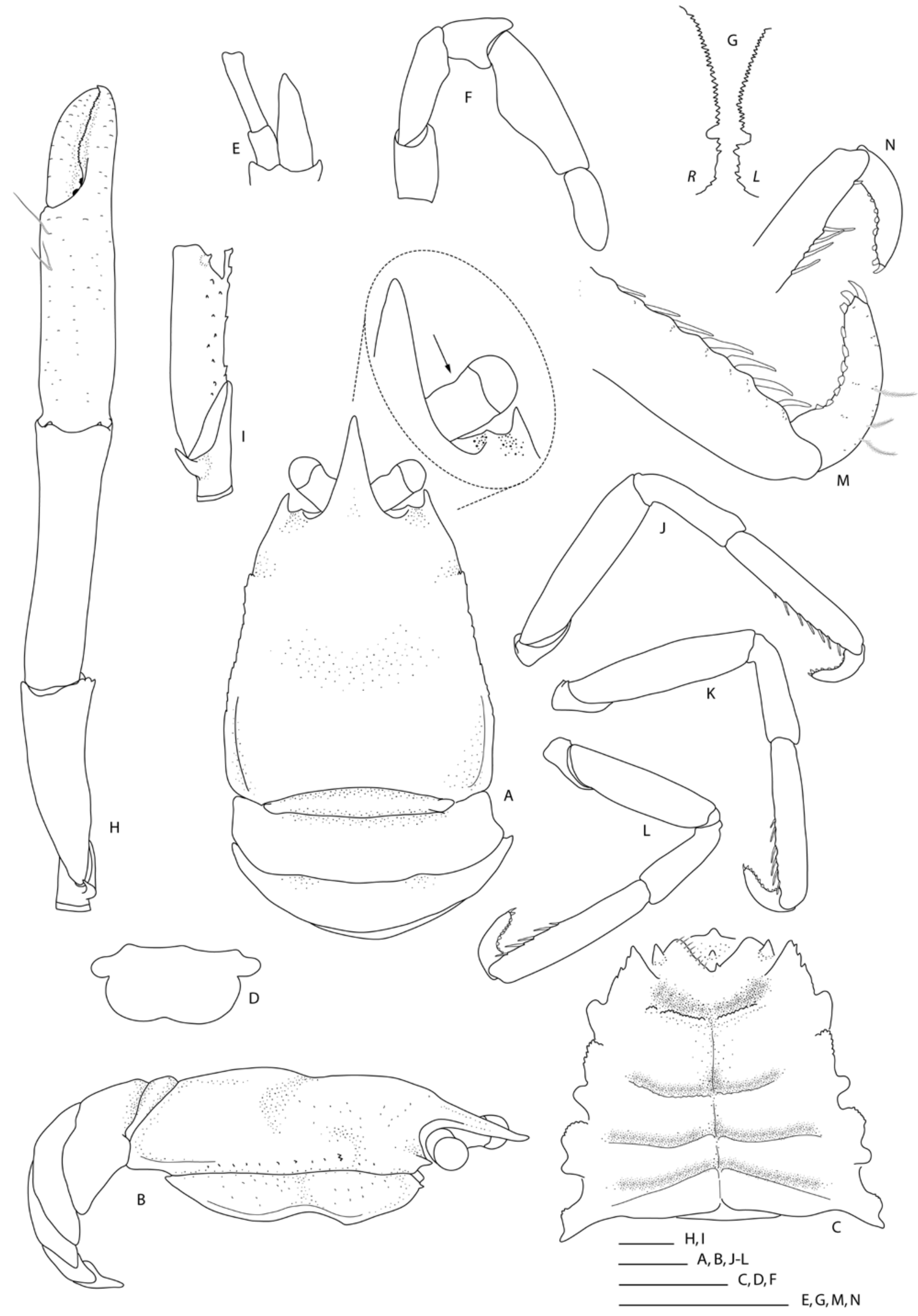


Figure 59. *Uroptychus brevisquamatus* Baba, 1988, A–M, female, NIWA 82666; N, female NIWA 24579: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of left and right Mxp3; **H.** right cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, P2, lateral; **N.** P2 distal propodus and dactylus. Scale bars = 2 mm.

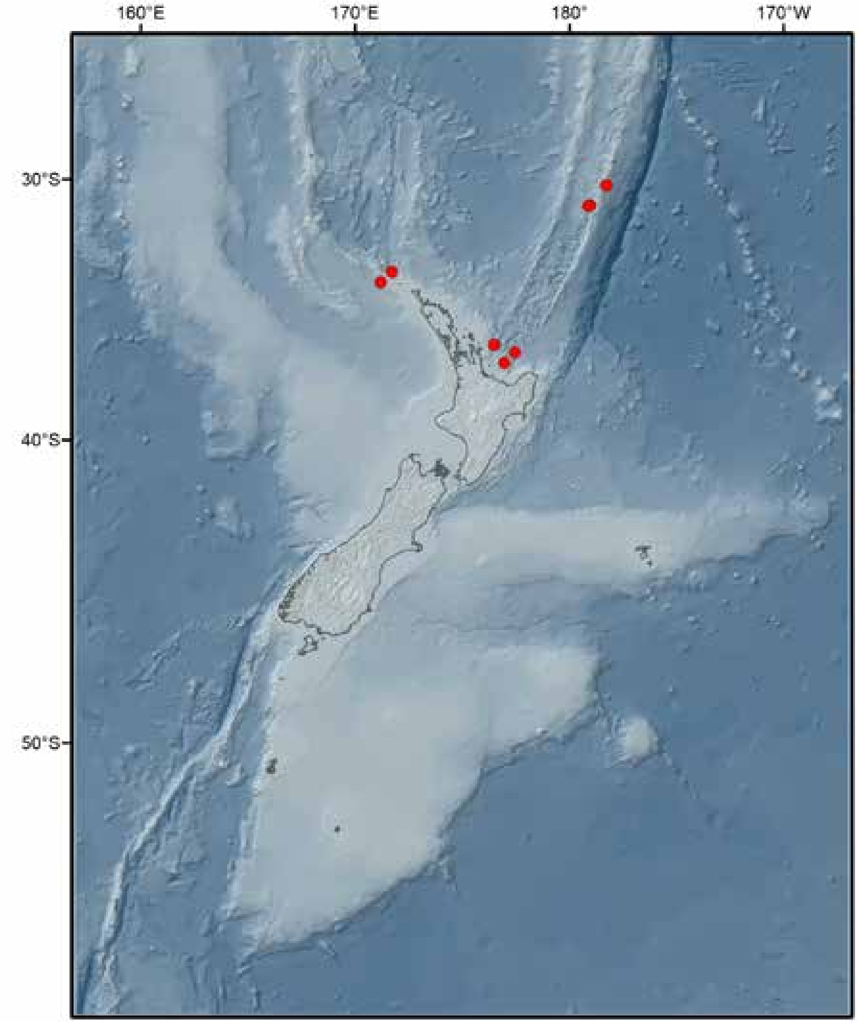


Figure 60. Distribution of *Uroptychus brevisquamatus* Baba, 1988 around New Zealand.

sternite 3 is asymmetrical in NIWA 82666 (Fig. 59C), but all other specimens have a symmetrical median notch with submedian spines. The cheliped ranges from 2.9 × cl (large male, NIWA 88552), 2.8 × (large female, NIWA 82666) to 2.4 × (small male, NIWA 76189). The cheliped palm is most massive in the largest male, 2.5 × as long as wide in male NIWA 88552 compared to 2.9 × in large female NIWA 82666 and 2.8 in the smallest male NIWA 76189. The ventrodistal angle of the cheliped ischium typically bears a spine, which is most prominent in large specimens, e.g. in the large female (cl 11.2 mm; NMNZ CR.019807). This is similar to the female holotype (cl 11.2 mm) which bears a 'well developed ventral spine'. Baba (2018) examined nearly 30 specimens from the southwestern Pacific (Solomon Islands to Norfolk Ridge) and noted a 'short subterminal spine'. However, the large female (cl 11.3 mm, NIWA 82666), illustrated here bears no spine along the ventral margin (Fig. 59I). The small female (NIWA 24579) atypically shows a clear gap in the propodal spination of P2–4, although the specimen clearly aligns with the other specimens using DNA sequencing (see below).

Uroptychus brevisquamatus shares unusual spination of the propodi and dactyli of the walking legs with *U. singularis* Baba & Lin, 2008 from Taiwan, but it differs in the overall proportion of the carapace (as long as broad instead of longer than broad), no epigastric spine instead of paired epigastric spines, and a wide antennal scale (about twice as wide as the peduncle) compared to about as wide as the peduncle.

Other similar species to *U. brevisquamatus* in New Zealand are *U. australis* (Henderson, 1885), *U. disangulatus* Baba, 2018, *U. webberi* Schnabel, 2009a, all sharing the inclined spines on P2–4 dactyli and row of spines on propodi, and *U. maori* Baba, 1974, which has a similar carapace shape and wide antennal scale. None of these have a single terminal spine only on the P2–4 propodal flexor margin (the spines are always paired). In addition, in *U. australis*, the P4 merus length is about 0.6 × P2 merus length (around 0.9 in *U. brevisquamatus*) and the carapace is much longer than wide (as long as wide in *U. brevisquamatus*); in *U. webberi* the carapace lateral margins are subparallel and not convexly divergent as in *U. brevisquamatus*; and *U. maori* has the spines along the P2–4 dactylar flexor margin nearly perpendicularly arranged and not oriented parallel to the margin. In New Zealand, other than *U. brevisquamatus*, only *U. remotispinatus* bears a single distal spine on P2–4 propodi. They differ,

Figure 61. Live coloration of *Uroptychus cardus* Ahyong & Poore, 2004, NIWA 53501, Stn TAN0905/71. Image courtesy of Owen Anderson, NIWA.

however, in dactylar spination (regular parallel spines in *U. brevisquamatus* and erect spines with distinct distal gap in *U. remotispinatus*), the spination of the P2–4 propodal flexor margin (terminal spine is located at the distal end in *U. brevisquamatus*, while considerably distant from the distal end in *U. remotispinatus*) and the shape of thoracic sternite 4 (anterolateral margins more strongly divergent posteriorly and equally long as, instead of distinctly longer than, the posterolateral margin in *U. remotispinatus*).

Records provided here extend the range eastwards to the Kermadec Ridge and are deeper than previously reported (966 m in Baba, 2018).

DNA sequence data. Intraspecific sequence divergence for partial CO1 gene: 0.2–0.6% (four specimens). Closest interspecific divergences: 8.3–8.5% (*U. remotispinatus*, 3 specimens), 9% (*U. disangulatus*, 2 specimens), 9.6–9.7% (*U. maori*, 2 specimens).

Uroptychus cardus Ahyong & Poore, 2004

Figs 61–64, 177 A, F, G

Uroptychus cardus Ahyong & Poore, 2004: 31, fig. 7; Poore 2004: 225, fig. 61a (compilation); Baba 2005: 225 (synonymies, key); Baba *et al.* 2008: 30 (list and synonymies); Schnabel 2009b: 27 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list); Baba 2018: 28 (key).

Type & locality (not examined). Holotype—NMV J44744, Seamount, 82.5 km SSE of SE Cape, 44°14.4´S, 147°21.6´E, Tasmania, 987–1200 m, female (pcl 11.5 mm).

Material examined. *Chatham Rise*, *Graveyard Seamount Complex*: NIWA 23087, NIWA Stn TAN0104/399, 42°43.2–43.3′S, 179°57.63–57.97′W, Morgue Seamount, 1012–890 m, 21 Apr 2001, 2 females ov. (13. 9 mm, rostrum broken, pcl 10.5, 9.2 mm), 5 females (11.0, 10.3, 8.4, 7.9, 6.8 mm, pcl 7.8, 7.1, 5.6, 5.5, 4.7 mm), 3 males (14.9, 11.0, 8.8 mm, pcl 11.0, 7.8, 6.3 mm); NIWA 53501, NIWA Stn TAN0905/71, 42°44.17′S, 179°41.41–41.08′W, Dead Ringer Seamount, 820–1023 m, 22 Jun 2009, 1 female ov. (10.7 mm, pcl 7.7 mm), 2 males (11.0, 11.0 mm, pcl 7.8, 7.6 mm); NIWA 53514, NIWA Stn TAN0905/71, 42°44.17′S, 179°41.41–41.08′W, Dead Ringer Seamount, 820–1023 m, 22 Jun 2009, 4 females (9.3, 8.5, 8.2, 5.6 mm, pcl 6.3, 5.8, 6.0, 3.9 mm), 3 males (9.5, 8.0, 7.4 mm, pcl 6.5, 5.7, 5.1 mm); NIWA 26453, NIWA Stn TAN0604/9, 42°45.76–45.45′S, 179°55.51–55.36′W, Zombie Hill, 1019–1081 m, 28 May 2006, 8 female ov. (15.7, 15.6, 15.5, 15.2, 15.0, 15.0, 14.0, 13.9 mm, pcl 11.5, 11.7, 11.6, 11.1, 11.1, 11.1, 10.0, 9.8 mm); NIWA 26454, NIWA Stn TAN0604/10, 42°45.92–45.82′S, 179°55.69–56.22′W, Zombie Hill, 1005–1082 m, 28 May 2006, 1 female ov. (9.6 mm, pcl 7.7 mm); NIWA 23074, NIWA

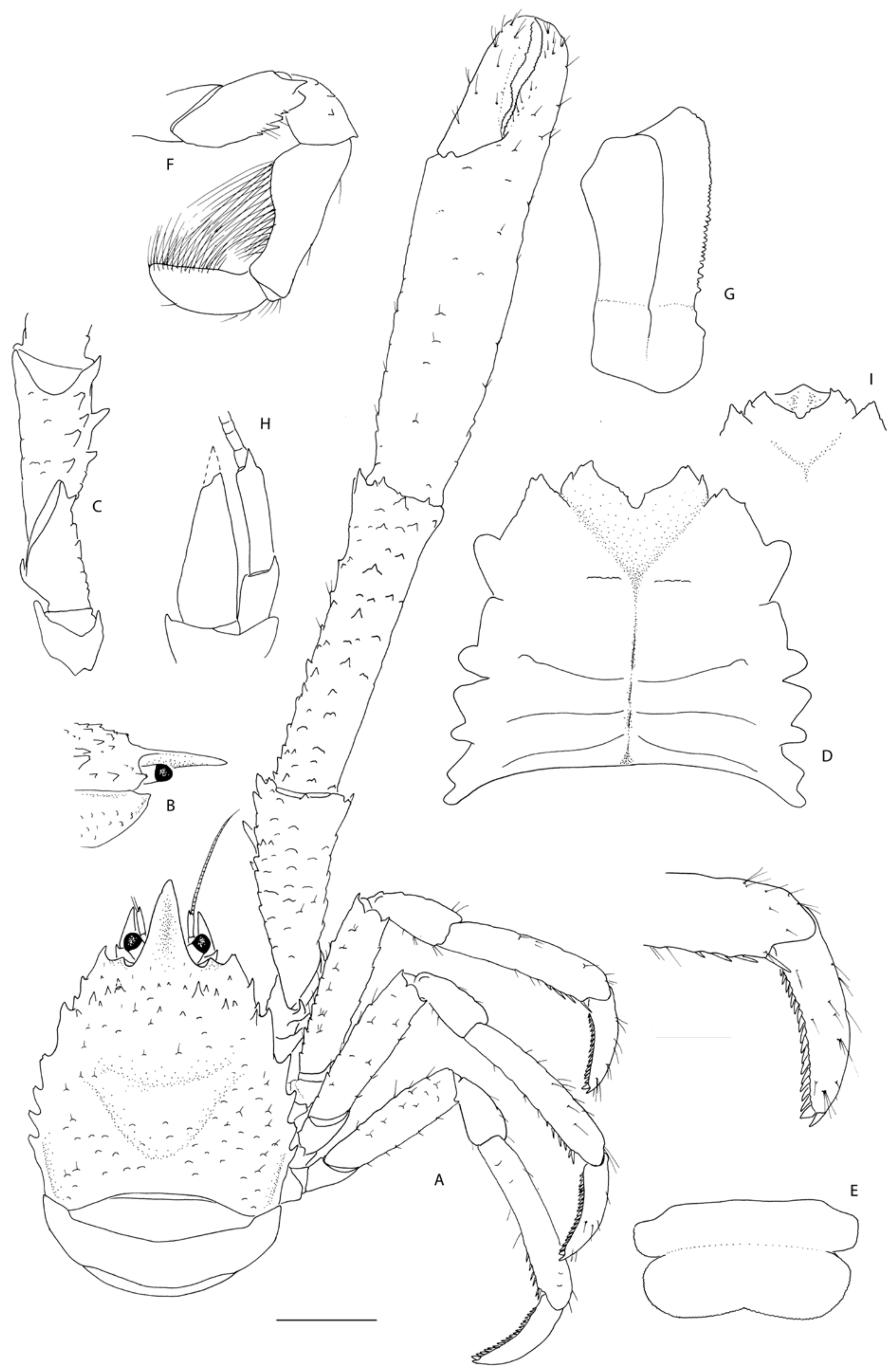


Figure 62. *Uroptychus cardus* Ahyong & Poore, 2004, A–G, holotype female, NMV J44744; I, male (5.9 mm), NIWA 23087: **A.** dorsal habitus; **B.** anterior carapace, right lateral; **C.** cheliped, right proximal ventral; **D.** sternal plastron; **E.** telson; **F.** Mxp3, right lateral; **G.** crista dentata, right; **H.** antenna, right ventral ; I. excavated sternum and anterior portion of sternal plastron. A–C = 5 mm, D–F = 2.5 mm, I = 2 mm, G–H = 1.3 mm. After Ahyong & Poore (2004).

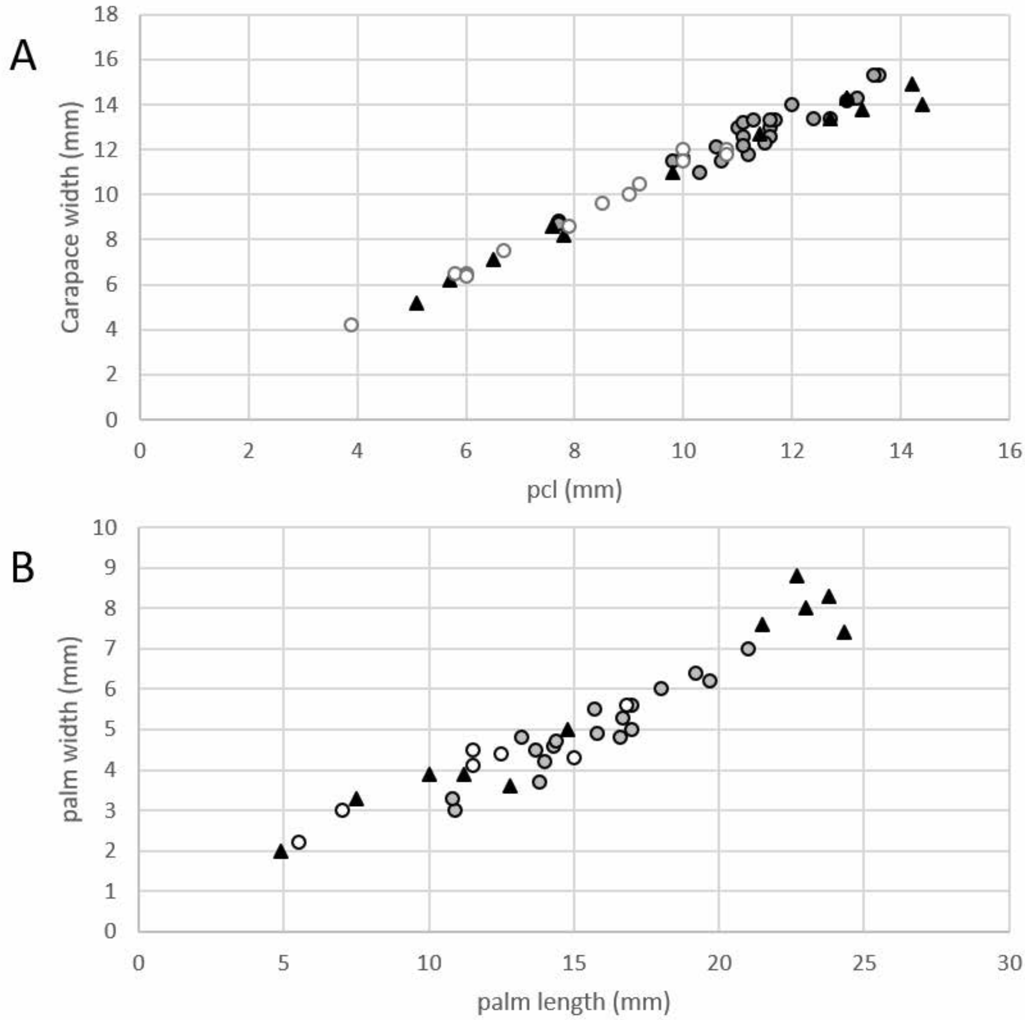


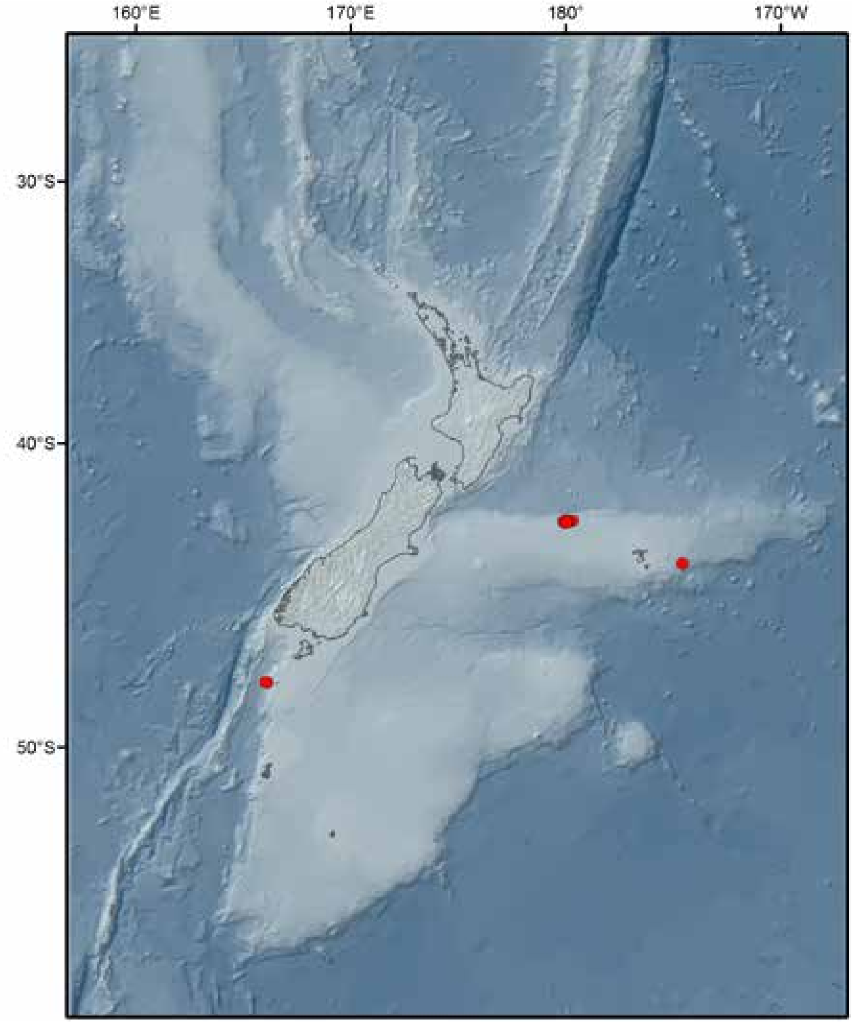
Figure 63. Comparative meristics for *Uroptychus cardus* Ahyong & Poore, 2004 of males (black triangles), females (white circles) and ovigerous females (grey circles): **A.** Carapace post-orbital length (pcl) versus carapace width (in mm); **B.** cheliped palm length versus width.

Stn TAN0104/198, 42°45.92′S, 179°55.62′E, Zombie Hill, 1058 m, 18 Apr 2001, 3 females ov. (14.7, 14.6, 13.0 mm, pcl 10.5, 10.6, 9.4 mm), 1 female (15.5 mm, pcl 11.5 mm), 3 males (16.8, 15.3, 13.5 mm, pcl 12.1, 11.0, 10.1 mm); NIWA 23072, NIWA Stn TAN0104/337, 42°46.00–46.08′S, 179°55.36–55.18′W, Zombie Hill, 970–900 m, 20 Apr 2001, 1 female (8.8 mm, pcl 6.0 mm); NIWA 23070, NIWA Stn TAN0104/337, 42°46.00–46.08′S, 179°55.36–55.18′W, Zombie Hill, 970–900 m, 20 Apr 2001, 1 female ov. (15.0 mm, pcl 11.0 mm), 1 female (broken carapace), 2 males (15.2, 14.0 mm, pcl 11.4, 9.8 mm); NIWA 23076, NIWA Stn TAN0104/197, 42°46.13–46.23′S, 179°55.68–55.74′E, Zombie Hill, 987–895 m, 18 Apr 2001, 3 females ov. (14.8, 14.5, 13.9 mm, pcl 11.2, 10.6, 10.3 mm); NIWA 19957, NZOI Stn X484, 42°45.94′S, 179°54.38′W, 899 m, 04 Jul 1994, 2 females ov. (15.4, 13.5 mm, pcl 10.8, 10.0 mm); NIWA 23086, NIWA Stn TAN0104/48, 42°47.17′S, 179°59.12′W, Diabolical Seamount, 993–900 m, 16 Apr 2001, 48 specimens (15.1–7.5 mm, pcl 11.2–5.0 mm); NIWA 23077, NIWA Stn TAN0104/48, 42°47.17′S, 179°59.12′W, 993–900 m, 16 Apr 2001, 1 female (12.2 mm, pcl 8.5 mm); NMNZ CR.025264 (ex NIWA 23073), NIWA Stn TAN0104/47, 42°47.57′S, 179°58.86′W, Diabolical Seamount, 950–900 m, 16 Apr 2001, 23 specimens (8.5–16.1 mm, pcl 5.8–11.4 mm); AM P.102307 (ex NIWA 23071), NIWA Stn TAN0104/47, 42°47.57′S, 179°58.86′W, Diabolical Seamount, 950–900 m, 16 Apr 2001, 3 females (14.0, 13.0, 11.5 mm, pcl 10.0, 9.2, 9.0 mm).

Chatham Rise, *Andes Seamount Complex*, *Ritchie Seamount*: NIWA 53914, NIWA Stn TAN0905/107, 44°10.61–10.80′S, 174°33.56–33.70′W, 760–960 m, 26 Jun 2009, 2 female ov. (16.0, 15.1 mm, pcl 11.6, 11.3 mm; larger female ov. sequenced, see Fig. 5), 1 female (11.2 mm, pcl 7.9 mm).

Subantarctic New Zealand region, *Solander Trough*: NIWA 19952, SOP Stn Z9583, 48°20′S, 166°06′E, 935 m, 25 Nov 1998, 5 females ov. (17.9, 17.7, 16.7, 16.3, 14.6 mm, pcl 13.0, 12.7, 12.4, 12.0, 10.7 mm), 1 female (9.7 mm, pcl 6.7 mm), 3 males (18.5, 17.9 mm, 1 broken rostrum, pcl 13.3, 13.0, 14.4 mm); NIWA 23085, SOP Stn Z9599, 48°02′S, 166°04′E, 1079 m, 28 Nov 1998, 4 females ov. (18.5, 18.0, 17.0, 15.4 m, pcl 13.5, 13.6, 13.2,

Figure 64. Distribution of *Uroptychus cardus* Ahyong & Poore, 2004 around New Zealand.



11.6 mm), 3 males (18.5, 18.0, 17.5 mm, pcl 14.2, 13.0, 12.7 mm).

Distribution. Tasmania, 987–1200 m; Chatham Rise (Graveyard and Andes Seamount complexes) and Solander Trough, 760–1082 m (Fig. 64).

Habitat. *Uroptychus cardus* was originally described from the Tasmanian seamounts and is one of the most locally abundant species in the New Zealand region, occurring only south of the tropical convergence and typically on seamounts; no data are available on any possible association with other organisms.

Diagnosis. Carapace dorsal surface slightly to distinctly rugose, with transverse field of 11–19 spines across epigastric region, laterally largest. Lateral margin with strong anterolateral spine, lateral orbital spine small to obsolescent; 6–8 large lateral spines in addition to anterolateral spine. Rostrum narrow (width < 0.5 × distance between anterolateral spines at base), with smooth margins. Antennal article 2 with outer spine; articles 4 and 5 with distal spine each; scale extending beyond article 5. Sternite 3 anterior margin typically with distinct median notch, submedian spines distinct or obsolescent. Sternite 4 with posterolateral margin shorter than anterolateral margin. P2–4 dactyli distally narrowing, with 12–20 sharp, not contiguous, obliquely directed spines, penultimate markedly broader than others.

Colour in life. Cream base colour, epigastric region of carapace gradually darker, apricot. Chelipeds slightly darker apricot, meri and carpi a shade darker than the palm (Fig. 61).

Remarks. The New Zealand specimens match the original description of four female specimens (cl 12.2–15.9 mm) from Tasmania well, but the examination of more than 120 specimens collected in the New Zealand region provides an opportunity to document variation. The smallest specimen examined (female NIWA 53514) has a cl of 5.6 mm and pcl 3.9 mm, the smallest ovigerous female has a cl of 9.6 mm and pcl 7.7 mm (NIWA 26454) and the largest specimens (cl 18.5 mm) are a male (pcl 13.5 mm, NIWA 19952) and an ovigerous female (pcl 14.2 mm) (Fig. 63A).

The carapace is typically as long as broad (without the rostrum) and dorsally always rugose but smoother in small specimens and increasingly rugose and spinose in larger specimens, particularly the epigastric spination increases with size. The lateral orbital spine can be small or obsolescent and the lateral carapace spine range from six to eight large spines, but a few small additional spines may be present at the posterior margin or situated posterior to the first branchial spine. The rostrum length can range from 0.25–0.50 × pcl and the lateral margins are typically smooth but can be slightly or distinctly serrated.

The first abdominal tergite always bears a distinct ridge, which was not illustrated or mentioned in the description (Fig. 62A) but is distinct in all specimens examined from New Zealand.

The anterior margin of the excavated sternum, not illustrated by Ahyong & Poore (2004), is anteriorly rounded and bears a low ridge, without a median spine or granule (Fig. 62I). The anterior margin of sternite 3 is typically deeply excavated with an acute frontal margin and a U- or V-shaped notch flanked by small or obsolescent submedian spines (notch can be faintly indicated, e.g. ov. female NIWA 23070). The anterolateral corner of sternite 4 typically bears one or more spines but can be angular or more rounded.

The size of the cheliped ranges are 2.2–5.0 × cl or 3.1–6.5 × pcl (the female holotype has a cheliped of 3.5 × cl or 4.5 × pcl) and large males generally have a longer cheliped and a more massive palm (Fig. 63B illustrates the cheliped palm length-width relationship, the pattern is similar for the pcl relative to cheliped length). The cheliped is increasingly spinose and granulose in large specimens and spines expand to the ventral surfaces of the meri and carpi.

The walking legs are always robust and rugose, with two to seven spines on the flexor margin of the propodi and 10–20 spines on the dactyli.

Up to 116 eggs were carried by a single female (diameter 1.5–1.6 mm, pcl 11.1 mm, NIWA 26453) and 50+ eggs of diameter 1.6–1.9 mm by female pcl 11.0 mm, NIWA 23070).

Uroptychus cardus is most similar to the group of species including *U. chathami* **sp. nov.**, *U. taranui* **sp. nov.**, *U. taranaki* **sp. nov.**, and *U. tasmani* **sp. nov.**, sharing a stout carapace (width exceeds length), with distinct lateral carapace spines, distinct spines on the antennal peduncle and Mxp3, and robust chelipeds and walking legs which have at least some setiferous ridges and spines. *Uroptychus cardus*, however, differs from all by the presence of epigastric spines and a smooth rostrum (the other species have at most a few small lateral tubercles and a trifid rostrum). See Table 1 and Fig. 177 (pages 262, 263) for a comparison of select diagnostic characters and illustrations of the pereopod morphology.

DNA sequence data. Interpecific sequence divergences for partial CO1 gene: >15% (large female ov. NIWA 53914 was sequenced).

Uroptychus chathami sp. nov.

Figs 65, 66, 177B, H, I

Material examined. Holotype NIWA 61863, NIWA Stn TAN0905/106, 44°10.50′S, 174°33.18′W, Ritchie Seamount, Andes Seamount Complex, Chatham Rise, 704–769 m, 26 Jun 2009, female ov. (8.6 mm, pcl 5.6 mm). **Paratypes** *Diamondhead Peak A*, *Andes Seamount Complex*: NIWA 54014, NIWA Stn TAN0905/112, 44°08.57′S, 174°43.49′W, 760–821 m, 27 Jun 2009, 17 females ov. (9.5–4.8 mm, pcl 6.7–4.8 mm), 2 females (8.8, 7.8 mm, pcl 6.0, 5.1 mm), 9 males (8.8–6.1 mm, pcl 6.1–4.2 mm); NMNZ CR.025231 (ex NIWA 54026), NIWA Stn TAN0905/112, 44°08.57′S, 174°43.49′W, 760–821 m, 27 Jun 2009, 3 females ov. (10.2, 9.3 mm, broken rostrum, pcl 7.5, 6.7, 6.5 mm), 2 males (7.5, 7.4 mm, pcl 5.1, 5.0 mm).

Other material. *Chatham Rise*, *Graveyard Seamount Complex*: NIWA 23128, NIWA Stn TAN0104/2, 42°45.93–46.12′S, 179°59.34–59.28′W, Graveyard Seamount, 875–757 m, 15 Apr 2001, 6 females (9.1, 7.5, 7.0, 6.2 mm, pcl 6.5, 5.2, 4.8 mm, 2 with carapace crushed), 1 male (7.8 mm, pcl 5.4 mm).

Chatham Rise, *Andes Seamount Complex*: NIWA 70967, NIWA Stn TAN0905/121, 44°01.67–01.87′S, 174°35.46–35.45′W, Aloha Seamount, 801–823 m, 28 Jun 2009, 1 female (4.8 mm, pcl 3.1 mm); NIWA 53684, NIWA Stn TAN0905/99, 44°08.38′S, 174°43.18′W, Diamondhead Peak A, 641–758 m, 26 Jun 2009, 1 female ov. (7.7 mm, pcl5.6 mm), 1 female (9.7 mm, pcl 6.7 mm), 1 male (damaged); NIWA 60515, NIWA Stn TAN0905/113, 44°08.97′S, 174°45.41′W, Diamondhead Peak B, 519–609 m, 27 Jun 2009, 1 female ov. (7.7, 6.8 mm, pcl 5.5, 4.5 mm), 3 females (8.0, 6.8, 4.6 mm, pcl 5.3, 4.6, 2.9 mm); AM P.102308 (ex NIWA 53963), NIWA Stn TAN0905/111, 44°08.85′S, 174°41.45′W, Diamondhead Peak C, 458–648 m, 27 Jun 2009, 1 female ov. (7.4 mm, pcl 5.0 mm), 3 males (7.5, 7.1, 6.0 mm, pcl 5.2, 5.2, 4.0 mm); NIWA 60528, NIWA Stn TAN0905/97, 44°08.84′S, 174°41.40′W, Diamondhead Peak C, 440–600 m, 26 Jun 2009, 1 female ov. (5.8 mm, pcl 4.0 mm), 1 female (8.9 mm, pcl 6.0 mm); NIWA 53781, NIWA Stn TAN0905/103, 44°09.47′S, 174°33.32′W, Iceberg Seamount, 520–650 m, 26 Jun 2009, 2 females ov. (8.0, ~8.0 mm, pcl 5.7, 5.6 mm); NIWA 102488, NIWA Stn TAN1503/116, 44°09.58–09.67′S, 174°33.29–33.36′W, Iceberg Seamount, 497–590 m, 11 Apr 2015, 1 female ov. (8.0 mm, pcl 5.8 mm); NIWA 53898, locality details same as for holotype, 1 male (9.5 mm, pcl 6.4 mm); NIWA 60523, locality details same as for holotype, 1 female ov. (9.1 mm, pcl 6.2 mm); NIWA 60516, locality details same as for

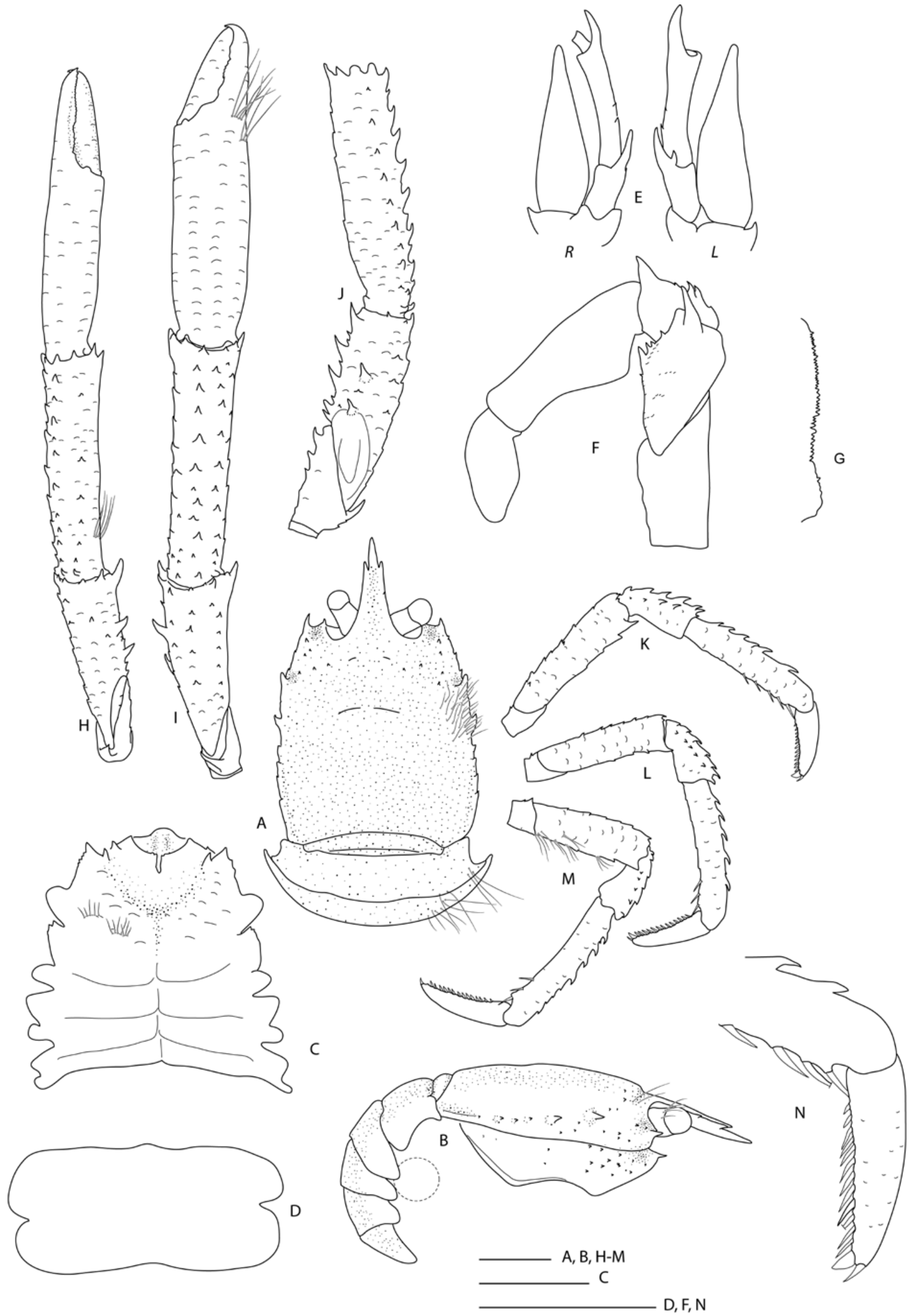
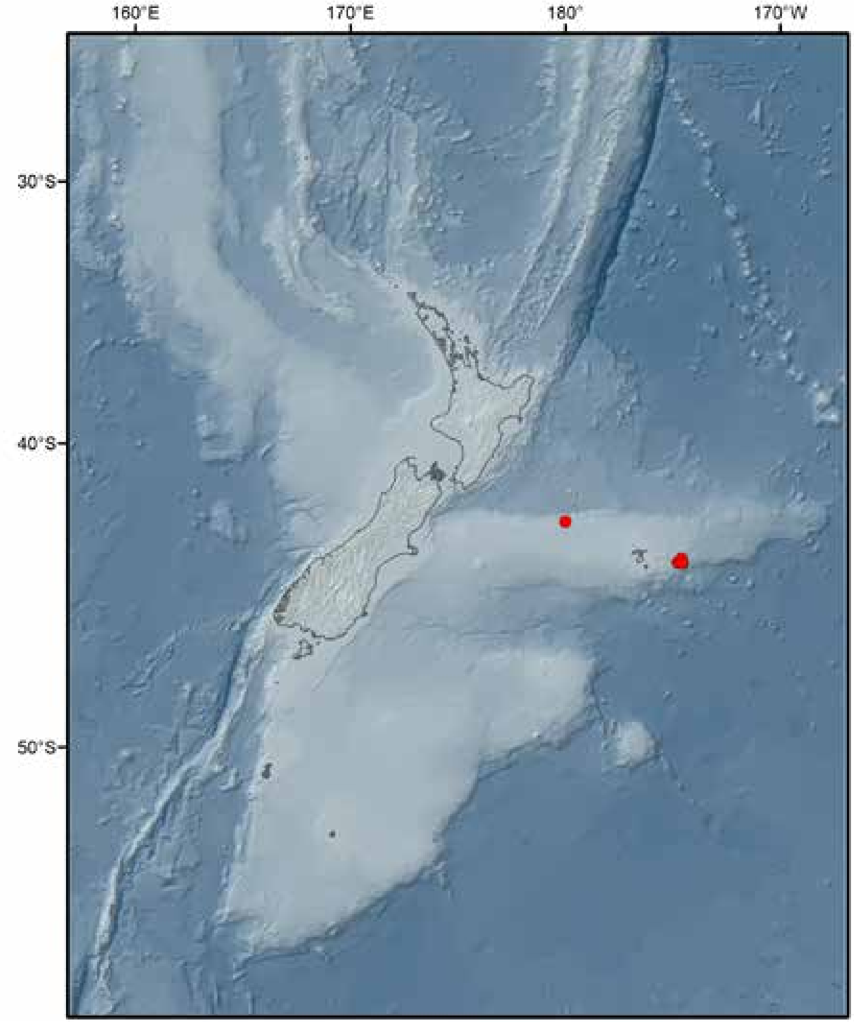


Figure 65. *Uroptychus chathami* **sp. nov.**, holotype, female ov., NIWA 61863: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left Mxp3; **H.** left cheliped, dorsal; **I.** right cheliped, dorsal; **J.** right cheliped, proximal articles, mesial; **K–M.** right P2–4; **N.** P2 distal propodus and dactylus. Scale bars = 2 mm.

Figure 66. Distribution of *Uroptychus chathami* **sp. nov.** around New Zealand.



holotype, 1 male (9.9 mm, pcl 6.7 mm; sequenced, see Fig. 5).

Type locality. Ritchie Seamount, Andes Seamount Complex, Chatham Rise, 704–769 m.

Distribution. Andes and Graveyard Seamount Complexes, Chatham Rise, 440–940 m (Fig. 66).

Habitat. Appears to be exclusively living on seamounts, all except one of the samples (NIWA 23128) are from the Andes Seamount complex. No data are available on possible faunal associations.

Diagnosis. Carapace dorsal surface armed with pair of hepatic spines and at most a few granules; surface granulose and plumose; lateral margin with distinct spines other than anterolateral spine, anterior branchial spines most prominent, posterior branchial spines small; anterolateral spine prominent, larger than lateral orbital spine. Rostrum narrow triangular, with pair of subapical spines. Anterior margin of sternite 3 with distinct notch, submedian spines obsolescent; sternite 4 anterolateral margin acute followed by serrations. Antennal scale overreaching peduncle. Mxp3 ischium unarmed; merus with strong distal spine and 4 flexor marginal spines; carpus with strong distal spine and distinct spines at midlength of extensor margin. Cheliped spinose. P2–4 meri dorsally with row of small spines or serrations, ventromesial margin unarmed; carpi dorsally spinose; propodi with pair of terminal spines preceded by unpaired spines along nearly entire extensor margin; dactyli tapering distally, slightly longer than carpi, flexor margin with ultimate spine slender, penultimate spine prominent, preceded by about 15 regularly arranged, inclined, slender and sharp spines.

Description. Carapace: As long as broad (pcl), strongly convex. Dorsal surface setose; gastric and hepatic regions with a few scattered small spines, otherwise unarmed; cervical groove indistinct (faintly indicated). Lateral orbital spine smaller than well-developed anterolateral spine. Lateral margins slightly convex, nearly subparallel along branchial region; with 8 or 9 spines excluding anterolateral spine: 2 or 3 small hepatic spines; 1 anterior branchial spine (plus granules accompanied by setal rows); 5 smaller posterior branchial spines; anterior branchial spine largest; posterolateral corner rounded, without distinct ridge. Rostrum narrow triangular (breadth < 0.5 × distance between anterolateral spines), slightly deflected ventrally, 0.5 × pcl; dorsal surface smooth, sparsely setose, dorsally excavated; lateral margins with pair of subapical spines [plus small granule at right midlength in holotype]. Pterygostomian flap covered with spines or spinules in anterior portion; anterior margin produced into spine.

Thoracic sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron 1.1 × as wide as long, sternites 5–7 laterally subparallel; surface smooth. Sternite 3 anterolaterally acute; anterior margin with median notch and small to obsolescent submedian spines; lateral corner with spine. Sternite 4 2.1 × as wide as sternite 3, anteriorly deep U-shaped, with short setiferous striae in anterior portion; midline grooved; anterolateral margin irregular, anteriorly produced to tooth, not overreaching sternite 3, with pair of spines mesially; laterally unarmed but irregular; anterolateral margin longer than posterolateral margin. Sternite 5 anterolateral margin acute and with irregular row of granules.

Abdomen: Tergites setose, smooth, without ridges and unarmed. Pleural margins of somites 2–4 rounded and not distinctly tapering. Telson 0.5 × as broad as long; posterior margin emarginated; posterior portion 1.3 × length of anterior portion.

Eyes: Setose. Cornea subglobular, 0.4 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine. Antennal article 3 unarmed. Article 4 with very long distal spine, spine as long as article; mesial margin unarmed. Article 5 armed with very long distomedian spine, about half length of article; mesial margin with two small spines. Antennal scale overreaching peduncle, 3–4 × as long as wide.

Maxilliped 3: Coxa with small lateral spine. Basis with some obsolescent denticles along mesial ridge. Ischium without distal spines; 35 denticles on crista dentata. Merus extensor margin with strong distal spine; flexor margin with 4 spines distal to midline. Carpus extensor margin with 3 or 4 teeth, distal spine strong.

Cheliped: slender; 4.0–3.8 × pcl. Ischium with dorsal and long slender ventral spines distally and with row of spinules on ventromesial margin. Merus strongly spinose and covered with setiferous ridges, some of them with central spine; distally with seven spines. Carpus surface spinose, arranged in rows; with seven distal spines; length 1.1–1.2 × that of palm. Palm 2.9–3.3 × as long as wide, covered with long setiferous ridges. Dactylus 0.5 × propodus length; occlusal margins denticulate, without gape.

Pereopods 2–4: similar; surface rugose. Merus extensor and flexor margins with small spines and serrations along margins, ventrodistal spine prominent; 1.0–0.9 × as long as propodus (meri successively shortening posteriorly). Carpus dorsal margin with double row of six spines (including distal pair). Propodus 5.2–4.9 × longer than wide (from P2 to P4); extensor margin spinose along nearly entire margin; flexor margin not inflated, with 2–6 [2–4] spines along distal portion, in addition to distal pair; 1.7–1.6 × as long as dactylus (P4 with slightly shorter propodus and slightly longer dactylus). Dactylus nearly straight; slightly longer than carpus; flexor margin with 14 or 15 spines along entire length, penultimate spine prominent, more than twice as broad as ultimate, ultimate spine larger than antepenultimate; all spines proximal to penultimate spine very slender and sharp, close to one another but not contiguous.

Colour in life. Not known.

Etymology. Named for the Earl of Chatham, after whom the Chatham Islands were named in 1790 by Lieutenant Broughton (New Zealand Geographic Board). This species is only known from the Chatham Rise and the majority of specimens were collected on the Andes Seamount Complex, east of the Chatham Islands.

Remarks. The carapace-size range in the specimens of *U. chathami* **sp. nov.** examined is 2.9–7.5 mm for females (pcl, ovigerous females ranged from 4.0–7.5 mm) and 4.0–6.7 mm for males and meristics clearly changes with size and gender. Larger specimens are generally more spinose and rugose, e.g. the number of spines along margins of P2–4 dactyli is up to 17 (excluding a distal spine, compared to 13–14 in the holotype). The size and proportions of the cheliped also vary: the cheliped of the largest male (NIWA 60516, pcl 6.7 mm) is longer (4.5–4.6 × pcl) compared to 3.9 × in the smallest female (NIWA 60515, pcl 2.9 mm), and 3.8–4.0 × pcl in the female holotype (NIWA 61863, pcl 5.6 mm, Fig. 65). The carpus is slightly longer than the palm in the holotype and in the largest and smallest females (NIWA 54026, 60515, respectively) but the palm is slightly (1.2 ×) longer than the carpus in the largest male (NIWA 60516). The length-width ratio of the cheliped palm varies from 2.4 in the smallest specimen and 2.8 in the largest male to 2.9 and 3.3 × in the holotype, and the dactylus-palm length ratio varies (dactylus is 0.4 × palm in large males, 0.5 × in medium-sized females and 0.7 × in the smallest specimen). The occlusal margins, however, never gape when the fingers are closed. The proportion of the antennal scale also appears to vary considerably; in the holotype the scale length-width ratio is 3.0 and 3.4 for right and left, respectively. For example, in the smallest specimen the length-width ratio is 3.6 and 4.0 and in the largest male it is 3.7 and 4.2. Other specimens fall within this range with significantly different proportions from side to side. The scale always just overreaches the peduncle in length. The female holotype has a small secondary terminal spine on antennal article 4, which is unusual and does not occur in any others.

Uroptychus chathami **sp. nov.** is close to *U. taranui* **sp. nov.**, but distinct and constant differences are: (1) the posterior branchial spines along the lateral carapace are much more indistinct in *U. chathami* **sp. nov.** than those of *U. taranui* **sp. nov.**; and (2) *U. taranui* **sp. nov.** has four, nearly subequal, spines spread along the entire margin, while in *U. chathami* **sp. nov.** the anterior spine is distinct and followed by much smaller spines and serrations posteriorly; (3) the thoracic sternite 3 median notch is usually narrow in *U. chathami* **sp. nov.** (wide, U-shaped in *U. taranui* **sp. nov.**) and the sternite 4 anterior terminus is acute in *U. chathami* **sp. nov.** (rounded or with a few granules in *U. taranui* **sp. nov.**); (4) the Mxp3 has multiple spines along the extensor margin of the carpus in *U. chathami* **sp. nov.** (only one spine or granule in *U. taranui* **sp. nov.**); (5) most distinctly, the propodi of P2–4 have spines along the entire extensor margin in *U. chathami* **sp. nov.** (compared to only two proximal spines in *U. taranui* **sp. nov.**) and the cheliped is also typically more spinose in *U. chathami* **sp. nov.**, particularly the carpus with distinct rows of dorsal spines in *U. chathami* **sp. nov.** (tuberculate but not distinctly spinose in *U. taranui* **sp. nov.**). Also notable is the difference in the morphology of the P2–4 dactyli; in *U. chathami* **sp. nov.** the dactyli are comparably narrow and tapering, with very sharp and slender spines along the flexor margin that are not contiguous, whereas in *U. taranui* **sp. nov.** the dactyli are short and appear more truncate, with broader spines in comparison that are rounded and arranged close together, appearing contiguous (compare Fig. 177 H–I, L–M).

Uroptychus chathami **sp. nov.** and *U. taranui* **sp. nov.** are also similar to *U. taranaki* **sp. nov.** and *U. tasmani* **sp. nov.**; the differences between these four species are discussed under the account of the last-named.

Outside of New Zealand, *U. echinatus* Baba, 2018 from the Hunter and Matthew Islands is closest to *U. chathami* **sp. nov.** They match in most respects, but differences include the prominence of the anterior branchial spines, much larger than the posterior branchial spines in *U. chathami* **sp. nov.** and nearly subequal in size in *U. echinatus*; the anterior margin of the pterygostomian flap bears a strong spine and the anterior surface is granulose in *U. chathami* **sp. nov.**, compared to a small anterior spine and at most few granules on the surface in *U. echinatus*. The cheliped is also more spinose in *U. chathami* **sp. nov.**, with some scattered spines and prominent ridges on the dorsal merus surface, more prominent compared to *U. echinatus*. Finally, *U. chathami* **sp. nov.** has more spines along the flexor margin of the P2–4 propodi preceding the distal pair, at least on P2; one or two in *U. echinatus*, three or four in *U. chathami* **sp. nov.**

DNA sequence data. Closest interspecific sequence divergences for partial CO1 gene (NIWA 60516): 13.1% (*U. defayeae*), 13.6% (*U. nirvana* **sp. nov.**), 14% (*U. tomentosus*).

ZooBank registration. *Uroptychus chathami* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:7BA63D84-9883-439D-AA68-5911564A06ED.

Uroptychus cylindropus Baba, 2018 Figs 67, 68

Uroptychus cylindropus Baba, 2018: 152, figs 61, 62.

Type & locality (not examined). Holotype—MNHN-IU-2014-16370, SMIB 8 Stn DW156, 24°46′S, 168°08′E, Norfolk Ridge, 275–300 m, 28 Jan 1993, female ov. (pcl 5.3 mm).

Material examined. *Colville Ridge*, *Scoria Cone*: NIWA 86224, NIWA Stn TAN1213/21, 30°08.0–07.8′S, 179°46.2–46.0′E, 720–573 m, 18 Oct 2012, 1 male (8.1 mm, pcl 5.1 mm; sequenced, see Fig. 5).

Distribution. Loyalty Islands, southern New Caledonia, and Norfolk Ridge, 227–691 m; Colville Ridge, 573–720 m (Fig. 68).

Habitat. Unknown.

Diagnosis. Carapace smooth laterally and dorsally; anterolateral margin round and unarmed; lateral orbital spine small. Rostrum long, around 0.7–0.8 × pcl, nearly horizontal. Sternite 3 anterolaterally rounded, anterior margin deeply V-shaped, without median notch. Antennal scales short, barely reaching mid-length of article 5. Mxp3 entirely unarmed, crista dentata of basis and ischium smooth. P2–4 subcylindrical, meri and carpi unarmed; P3 merus shorter than P4 merus; flexor margins of propodi with single terminal spine occasionally obsolete; P4 propodus 1.2 × longer than P2 and P3 propodi; dactyli distally tapering (not truncate), with 9–12 sharp triangular spines arranged nearly perpendicularly to margin, penultimate spine much larger than ultimate, subequal in width to antepenultimate.

Colour in life. Unknown.

Remarks. One small specimen of *U. cylindropus* was collected from a small cone situated on the central Colville Ridge and just north of an ancient volcano (Wysoczanski *et al.* 2012). This is an unusual species with a very long rostrum in proportion to the remaining carapace (0.7–0.8 × pcl), the absence of

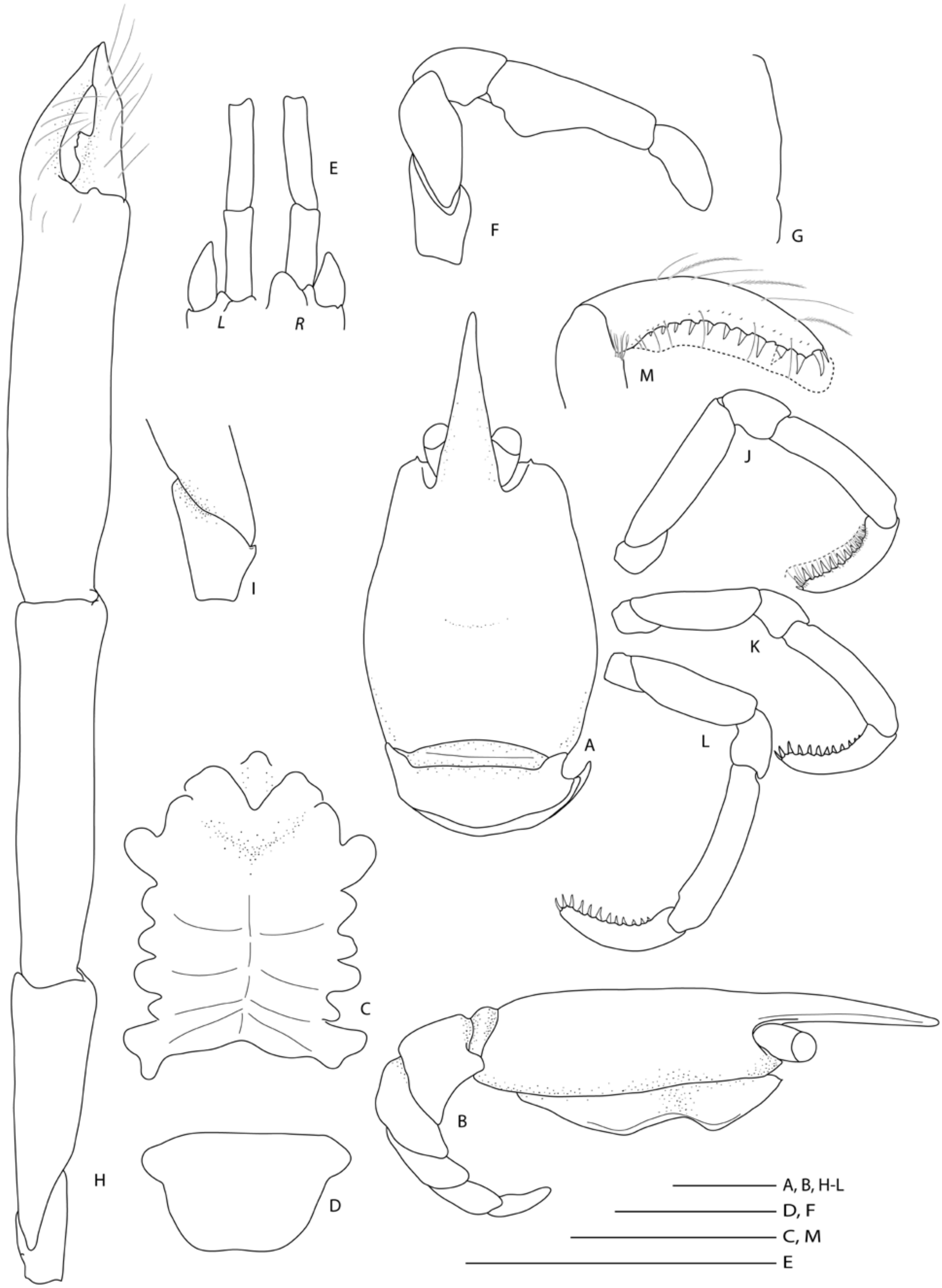


Figure 67. *Uroptychus cylindropus* Baba, 2018, male, NIWA 86224: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of right Mxp3; **H.** left cheliped, dorsal; **I.** right cheliped, proximal articles, mesial; **J–L.** right P2–4; **M.** P3 dactylus and distal propodus. Scale = 2 mm.

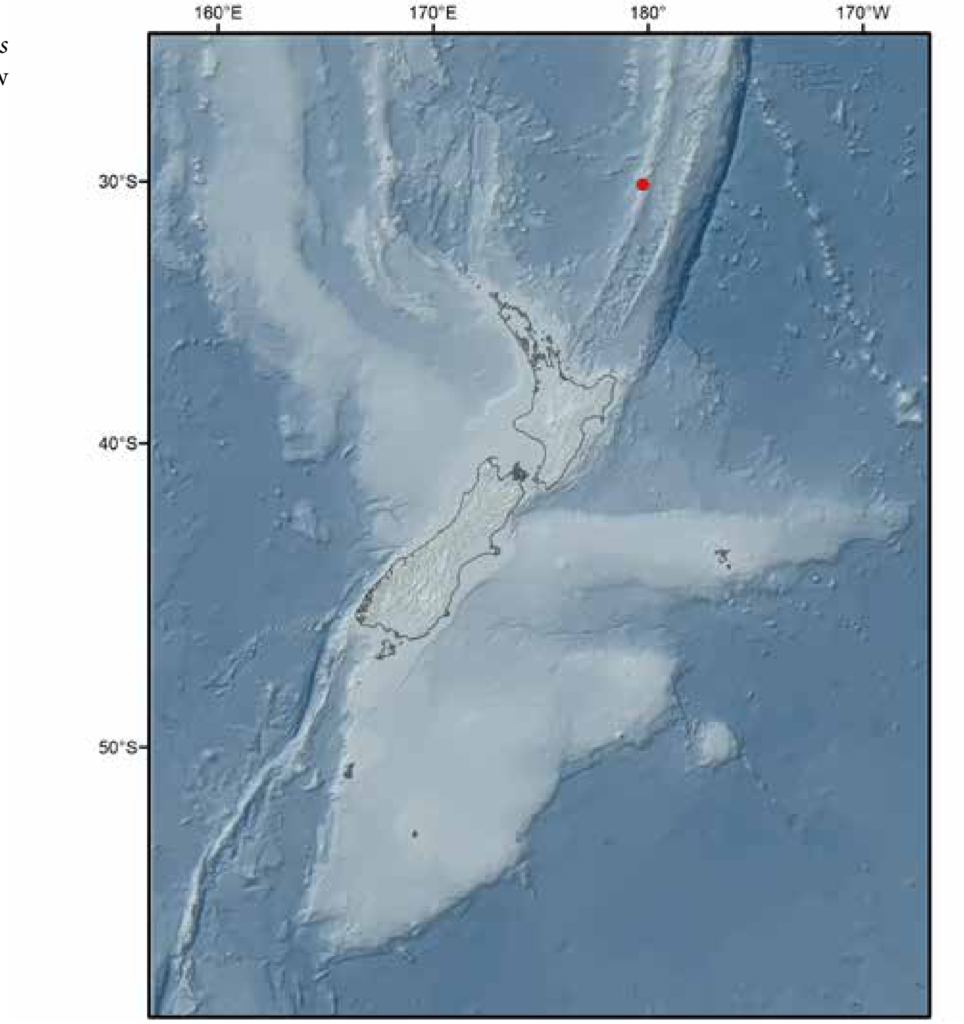


Figure 68. Distribution of *Uroptychus cylindropus* Baba, 2018 around New Zealand.

an anterolateral spine on the carapace (the margin is rounded) and P3 merus is shortest, which is unusual for this genus (P3 merus is 0.7 and 0.9 × the length of P2 and P4 meri, respectively, Fig. 67). Slight differences between the single specimen examined here, and the type specimen, as described by Baba (2018), are the sternal plastron of the new specimen is 0.9 × as wide as long (slightly longer than wide), while that of the type is slightly shorter than wide. The overall shape of the carapace and rostrum, shape of the sternum with a V-shaped anterior margin of sternite 3 and round anterolateral terminus of sternite 4 are similar otherwise. The walking legs of the New Zealand specimen may be a little stouter than reported by Baba (2018), who gave the length-width ratio P2–4 as 4.5 (P2) and 5.9 (P4). The proportions of the specimen examined here are between 3.5 (P2–3) and 4.0 (P4) but the unusual characteristic of the P3 merus being the shortest agrees with the type description. Baba (2018) notes that the flexor margins of the P2–4 propodi are distally furnished with 'single terminal spine occasionally obsolete' and illustrates the holotype with P3 and P4 distally bearing a small spine and P2 entirely unarmed. The New Zealand specimen lacks spines on all walking legs and the distal margin is instead furnished with a transverse fringe of setae.

Uroptychus cylindropus is close to *U. ihu* **sp. nov.** and differences are discussed under that species below.

DNA sequence data. Closest interspecific sequence divergences for partial CO1 gene (NIWA 86224): 14–15% (*U. ihu* **sp. nov.**).

Uroptychus defayeae Baba, 2018 Figs 69–71

Uroptychus defayeae Baba, 2018: 155, figs 63, 64.

Type & locality (not examined). Holotype—MNHN-IU-2014-16375, MUSORSTOM 8 Stn CP975, 19°23.60′S, 169°28.93′E, Vanuatu, 566–536 m, 22 Sep 1994, male (pcl 5.0 mm).

Material examined. *Reinga Ridge*: NMNZ CR.022684, NORFANZ Stn TAN0308/126, 33°23.41′S, 170°11.58′E, 490–526 m, 31 May 2003, 2 females ov. (5.9, 4.0 mm, pcl 4.6, 2.9 mm; both sequenced, see Fig. 5).

Bay of Plenty, *White Island*: NMNZ CR.025232, Haul 13, 37°32.5′S, 177°21.3′E, 600–731 m, 1 male (5.1 mm, pcl 3.5 mm).

Figure 69. Live coloration of *Uroptychus defayeae*, female ov., pcl 4.2 mm, NIWA 80760, TAN1106/5. Scale = 1 cm.

Challenger Plateau: NMNZ CR.025233, NZOI Stn E906, 38°39.00′S, 172°38.00′E, 691–751 m, 28 Mar 1968, 1 female (4.0 mm, pcl 3.2 mm), 3 males (5.1, 4.6, 4.3, pcl 3.8, 3.5, 3.1 mm); NIWA 117992, NIWA Stn TAN0707/93, 39°32.62–32.13′S, 169°32.62–42.82′E, 634–636 m, 4 Jun 2007, 1 male (5.5 mm, pcl 4.0 mm).

Subantarctic New Zealand region, *Solander Trough*: NIWA 80760, NIWA Stn TAN1106/5, 46°32.38–32.39′S, 166°26.67–26.69′E, 542–530 m, 13 Apr 2011, 1 female ov. (6.5 mm, pcl 4.2 mm; sequenced, see Fig. 5).

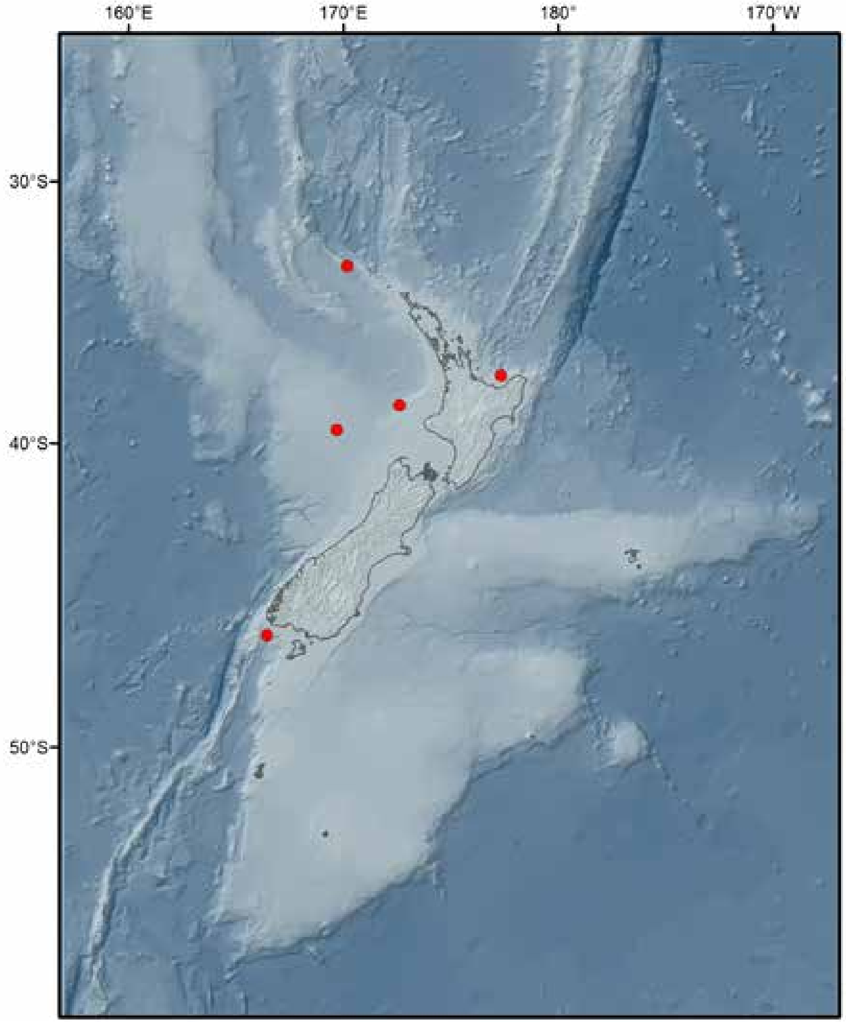
Distribution. Chesterfield Islands, Vanuatu, and Norfolk Ridge, 536–1000 m; Reinga Ridge, Bay of Plenty, Challenger Plateau, Solander Trough, 490–732 m (Fig. 71).

Habitat. Unknown.

Diagnosis. Carapace lateral margins strongly convexly divergent, with strong anterolateral and distinct anterior branchial spine, small hepatic spines or granules may be present, row of 4 or 5 small posterior branchial spines remote from anterior branchial spine; one small pair of epigastric spines or granules typically present dorsally, otherwise smooth. Rostrum short and narrow, barely reaching or just over-reaching ocular peduncle. Abdominal pleura of somite 3 not strongly tapering and anteriorly concave in females. Antennal article 2 with large lateral spine; peduncle unarmed; antennal scale not reaching midlength of article 5. Sternal plastron wide compared to length, lateral margins convexly divergent posteriorly; anterolateral corners of sternites 3 and 4 rounded. Cheliped length 5–7 × pcl; ischium with strong dorsal spine; merus with a few granules or spines along proximal mesial surface; carpus about as long as palm, smooth; movable finger 0.3–0.4 × as long as palm. P2–4 unarmed on meri and carpi; propodi flexor margins not inflated distally, with distal pair of spines only; dactyli tapering distally (not truncate), progressively longer from P2 to P4 (dactylus-propodus length ratios of 0.6–0.8), with 7–9 sharp triangular spines arranged regularly and perpendicular to margin, penultimate spine slightly larger than

Figure 70. *Uroptychus defayeae* Baba, 2018, female ov., NIWA 80760: **A.** carapace and abdomen and three eggs, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of left and right Mxp3; **H.** right cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** P2 dactylus and distal propodus; **N.** right pleura of abdominal somites 2–4, dorsolateral. Scale bars = 2 mm.

Figure 71. Distribution of *Uroptychus defayeae* Baba, 2018 around New Zealand.



ultimate spine and subequal to antepenultimate.

Colour in life. Base colour light pink or orange; gastric region median dark red spot; barred chelipeds (dark orange or red bar distally and bar at midlength of carpus and palm) (Fig. 69).

Remarks. Nine specimens of *U. defayeae* collected from across the New Zealand region (Reinga Ridge to the Solander Trough, Fig. 71) share the small to obsolescent spines on the carapace epigastric and lateral hepatic region, a row of distinct small spines in the lateral branchial region, strong lateral spine on the basal antennal article 2 and the anterolateral margins of the abdominal pleura are not strongly tapering and concave. Slight variation across the material is observed, e.g. the carapace ornamentation varies dorsally with small epigastric spines (NIWA 80760, most pronounced, Fig. 70), to no indication of spines or granules (NMNZ CR.025233). Lateral ornamentation always includes the distinct anterior branchial spine and three to five small spines or granules in the posterior branchial region which, typically, has the first of the posterior branchial spines most pronounced, followed by three or four spines that progressively diminish in size posteriorly. The hepatic region is smooth (NMNZ CR.22684) or with one small spine (NIWA 80760, Fig. 70). The cheliped is nearly entirely smooth except for some granules on the mesial surface of the merus and a strong ventral spine on the ischium, males appear to have slightly longer total cheliped length (6.5–7.5 × pcl) compared to females (5.0–6.2 × pcl) and a slighly more robust palm (4.4 compared to about 5.0 length-width ratio for males and females, respectively). In these respects, they align with the material reported by Baba (2018).

Two specimens of *U. defayeae* from both the Reinga Ridge and the Solander Trough have nearly identical CO1 sequences (< 0.3% divergence, see below) and were 0.8–0.9% different from a sequence generated from a specimen collected from NW Australia (~13° S, 123° E) (McCallum & Andreakis, unpublished). Unfortunately, it was not possible to compare these sequences with the original material described by Baba (2018).

Uroptychus defayeae is distinctive in appearance owing to the pronounced strong lateral spine in the anterior branchial region followed by the lateral constriction at midlength and the strongly convexly divergent posterior portion of the carapace. The abdomen is wide compared to the carapace and the sternal plastron is very wide. In that respect it most closely resembles species of the genus *Heteroptychus* Baba, 2018, but the carapace of these species is unarmed, the antennal scale is minute and, in some cases, fused with article 2, and not reaching the end of the antennal article 4, the posterior margin of the sternal plastron is strongly invaginated, and the dactyli and propodi of the walking legs are strongly sub-prehensile.

In New Zealand, *U. defayeae* most closely resembles *U. rungapapa* **sp. nov.** but is easily distinguished by the very small cornea (just over 0.1 × length of ocular peduncle in *U. rungapapa* **sp. nov.** and a little less than half the length in *U. defayeae*), and the narrow rostrum compared to length (length-width ratio of 2.3 in *U. rungapapa* **sp. nov.** compared to 1.0–1.4 in *U. defayeae*). The carpus of the cheliped is much shorter than the palm in *U. rungapapa* **sp. nov.** and both are subequal in length in *U. defayeae*; and the propodi of the walking legs have a row of spines in *U. rungapapa* **sp. nov.** and only a pair of distal spines in *U. defayeae*.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.0–0.3% (three New Zealand specimens), and 0.8–0.9% compared to a specimen collected off NW Australia (NMV J56415).

Uroptychus depressus Baba, 2018 Figs 72–74

Uroptychus depressus Baba, 2018: 170, figs 71,72.

Type & locality (not examined). Holotype—MNHN-IU-2012-691, CHALCAL 2 Stn CP22, 24°40′S, 168°39′E, Norfolk Ridge, 650–750 m, 29 Oct 1986, female (pcl 4.5 mm).

Material examined. *West Cavalli Seamount*: NIWA 3615, NIWA Stn KAH0204/32, 34°09.7′S, 173°57.7′E, 810–780 m, 17 Apr 2002, 1 female ov. (6.5 mm, pcl 4.4 mm), 1 male (5.0 mm, pcl 3.5 mm).

Distribution. Wallis and Futuna Islands, Tonga and Norfolk Ridge, 640–750 m; Cavalli Seamount (off Northland Plateau), 780–810 m (Fig. 74).

Habitat. Unknown.

Diagnosis. Carapace dorsally smooth except for a few minute epigastric granules or spines; a pair of minute hepatic spines present or absent; gastric region distinctly preceded by depressed rostrum; anterolateral spine larger than lateral orbital spine; lateral margin with prominent anterior branchial spine, followed by series of much smaller spines posteriorly. Rostrum narrow triangular (width < 0.5 distance between anterolateral spines). Antennal peduncle article 4 with small distal spine, article 5 unarmed; scale overreaching peduncle. Sternite 3 anterior margin with median notch, with or without distinct submedian spines. Sternite 4 with posterolateral margin longer than anterolateral margin. P2–4 meri and carpi with small distodorsal spines only; dactyli distally narrowed, with 18–23 inclined, closely spaced spines along flexor margin; penultimate spine about twice as broad as antepenultimate spine; ultimate spine much narrower than antepenultimate; P4 dactylus longest.

Colour in life. Not known.

Remarks. Both the male (pcl 3.5 mm) and the female (pcl 4.5 mm) of *U. depressus* are nearly exactly the same size as the male and female types reported by Baba (2018) from Wallis and Futuna Islands and Norfolk Ridge, respectively, and they match the original description well. Slight variation among the material examined and with the species description are as follows:

- the epigastric and hepatic spines are barely discernible in the smaller male, but the height difference between the hepatic region and the depressed rostrum in lateral view is still distinct;
- the distal portion of the rostrum appears nearly smooth in the smaller male, two pairs of denticles are barely discernible;
- the anterior margin of sternite 3 of the male lacks the distinctive median notch and submedian spines and is more sinuous, but otherwise matches the type description (Fig. 73B);
- the left and right antennal scales of the female have one and two lateral spines, respectively (smooth in holotype) and are narrower and distally rounded in the male (Fig. 72E, 73C);
- the cheliped length of the New Zealand specimens is 5.0–6.0 × pcl (5.5–6.0 fide Baba 2018) and the differences in ratio of palm length-width for the male (3.5 and 3.6 for left and right, respectively) and female (5.6 and 5.0, respectively) is similar. The palm-dactylus length ratio of the New Zealand specimen, however, ranges from 2.0/2.1 for the male (left/right) to 3.1/2.7 for the female (left/right) compared to 3.0 reported by Baba (2018). Although not noted in the type description, the relative length of the merus differs between sexes, with the female merus being longer (0.7 × carpus length compared to 0.8 × for the female [Fig. 73E, F]);
- the dactyli of the walking legs have up to 23 spines in addition to the distal spine compared to 18 or 19 reported for holotype.

Uroptychus depressus most closely resembles *U. levicrustus* Baba, 1988 from the Moluccas and *U. kareenae* Baba, 2018, from the Solomon Islands. It differs from both of these by the following combination: an antennal scale distinctly overreaching the peduncle

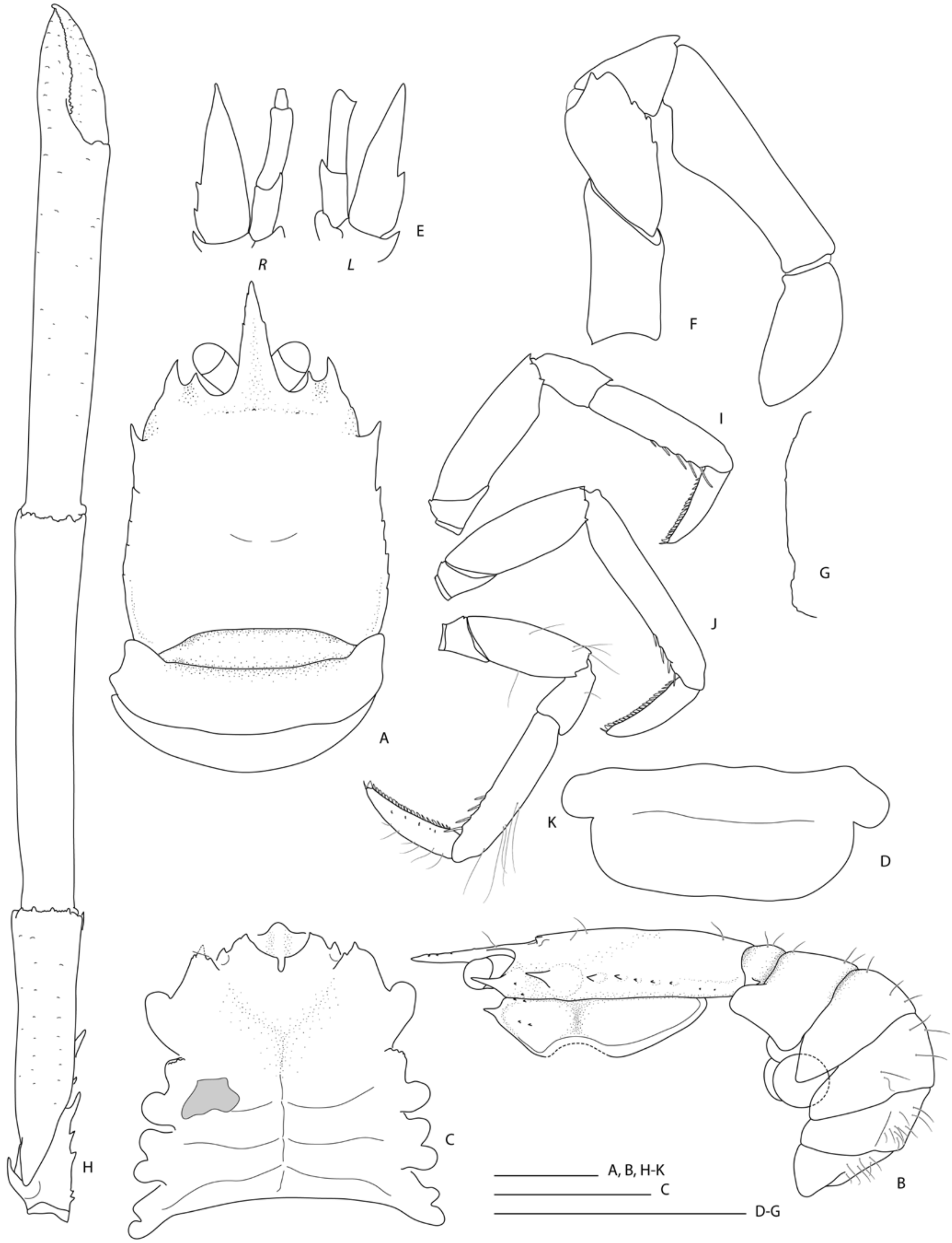


Figure 72. *Uroptychus depressus* Baba, 2018, female ov., NIWA 3615: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen with eggs, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of left Mxp3; **H.** left cheliped, dorsal; **I–K.** right P2–4. Scale bars = 2 mm.

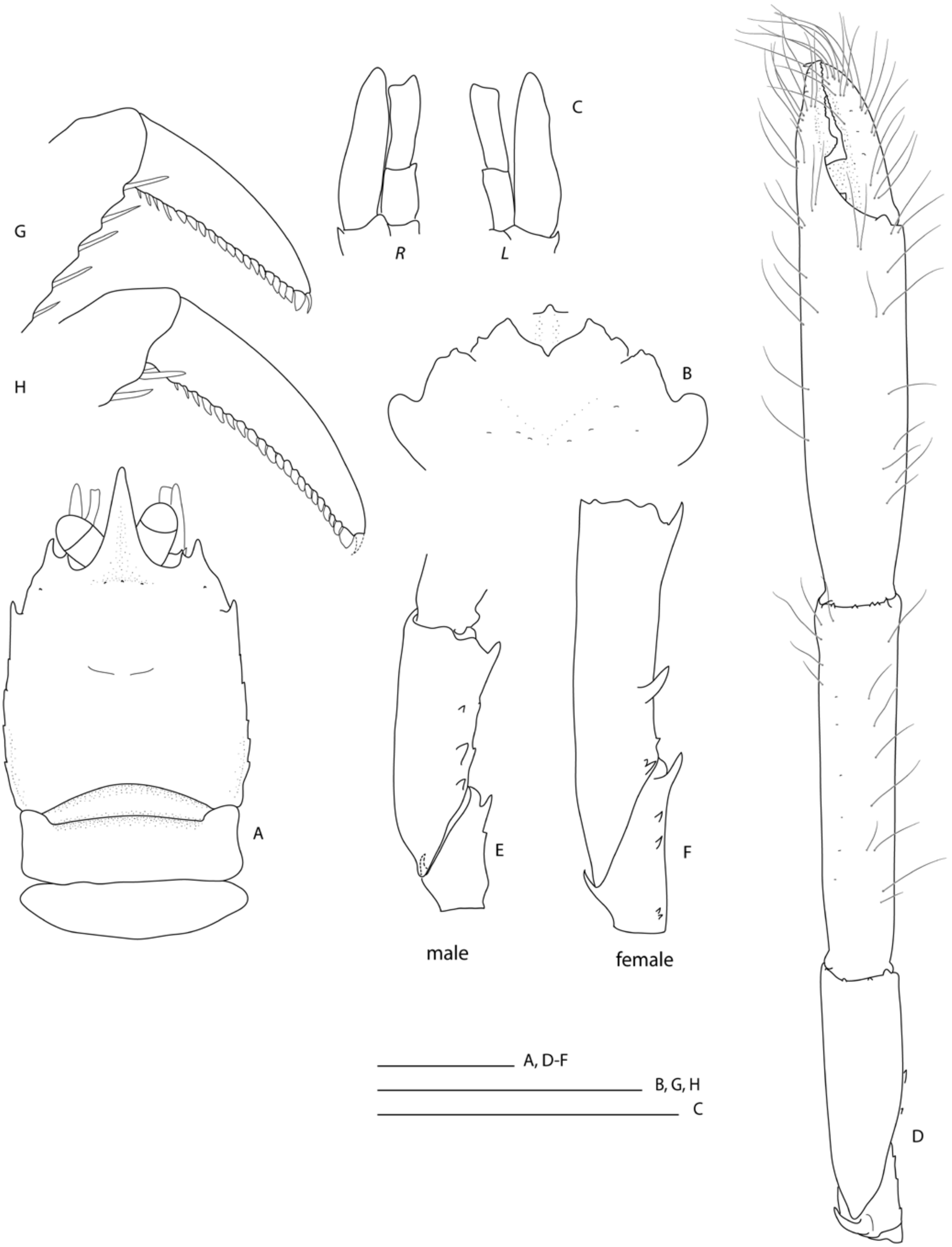
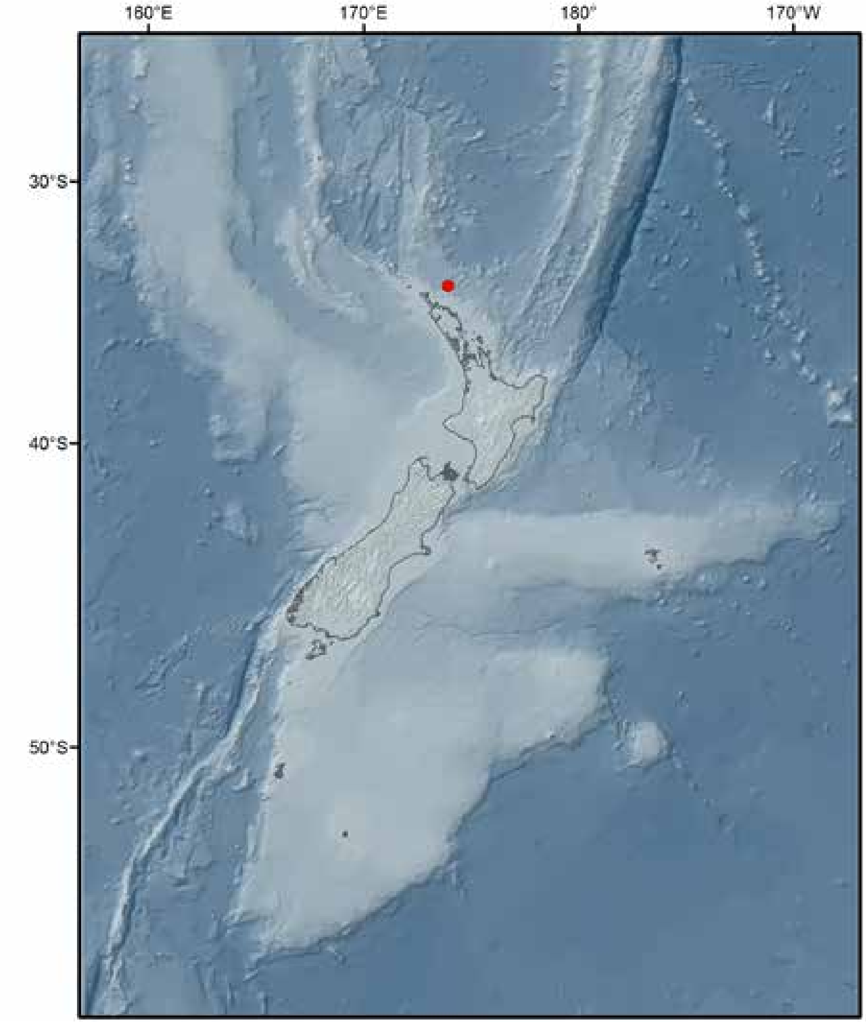


Figure 73. *Uroptychus depressus* Baba, 2018, A–E, male, F–H, female ov., NIWA 3615: **A.** carapace and abdomen, dorsal; **B.** excavated sternum and anterior portion of sternal plastron; **C.** antenna, right and left, ventral; **D.** left cheliped, dorsal; **E**, **F.** cheliped ischiomerus, left, mesial; **G.** P2 dactylus and distal propodus, lateral; **H.** P4 dactylus and distal propodus, lateral. Scale bars = 2 mm.

Figure 74. Distribution of *Uroptychus depressus* Baba, 2018 around New Zealand.



(versus not reaching the end in *U. levicrustus* and slightly overreaching in *U. kareenae*); the P2–4 meri and carpi having a small dorsodistal spine each, absent in both *U. levicrustus* and *U. kareenae*; and the transition from gastric region to rostrum abrupt, with the rostrum distinctly depressed in *U. depressus* (Fig. 72B, gradual in both *U. levicrustus* and *U. kareenae*).

Uroptychus disangulatus Baba, 2018 Figs 75–76

Uroptychus disangulatus Baba, 2018: 178, figs 76, 77.

Type & locality (not examined). Holotype—MNHN-IU-2014-16390, Benthaus Stn DW1898, 27°34.3′S, 144°26.6′W, 580–820 m, 8 Nov 2002, female ov. (pcl 8.0 mm).

Material examined. NIWA 86189, NIRVANA Stn TAN1213/21, 30°7.98–7.83′S, 179°46.16–45.98′E, 'Scoria cone' Colville Ridge, 720–573 m, 18 Oct 2012, 2 females ov. (11.5, 9.5 mm, pcl 8.8, 7.5 mm; small female ov. sequenced, see Fig. 5), 1 female (10.4 mm, pcl 8.0 mm; sequenced, see Fig. 5), 1 male (8.2 mm, pcl 6.1 mm).

Distribution. Hunter-Matthew, Norfolk Ridge, Colville Ridge (Fig. 76) and French Polynesia; in 200–820 m.

Habitat. Unknown.

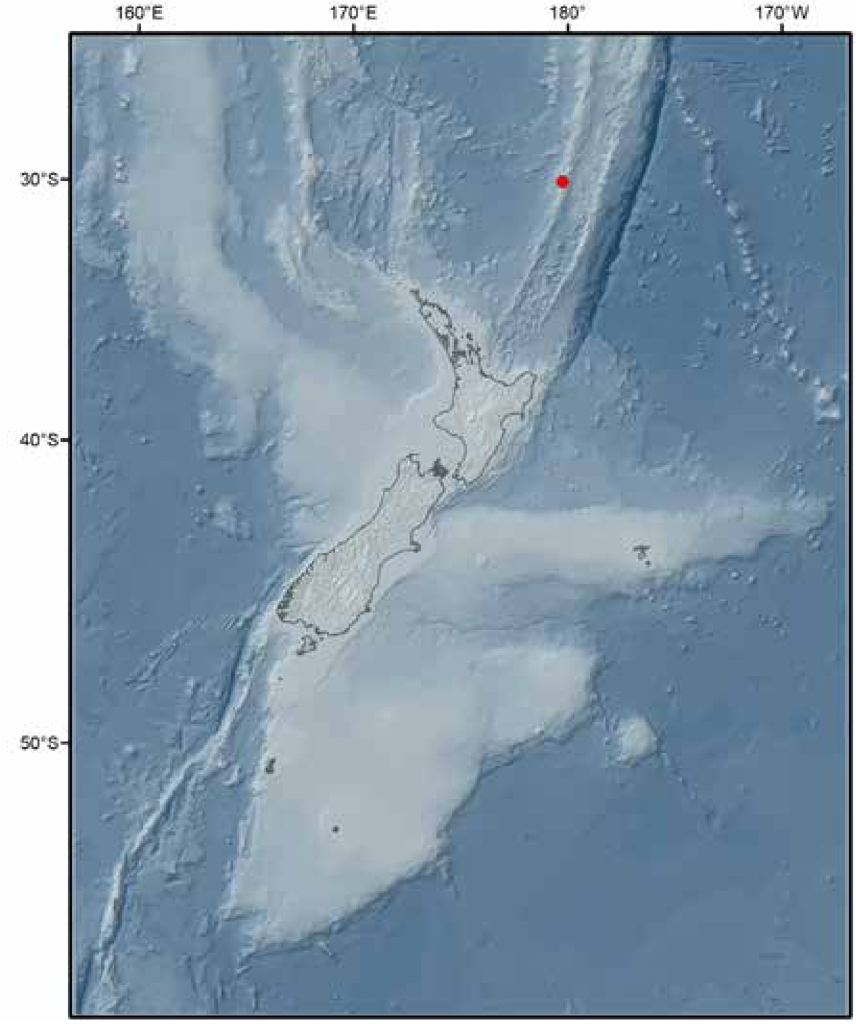
Diagnosis. Carapace smooth on dorsal surface; about as long as broad (without rostrum); lateral margin without distinct spine, other than strong anterolateral spine, branchial margins convexly divergent. Lateral orbital spine absent or small. Rostrum narrow triangular. Ocular peduncle with mesial depression proximal to cornea. Antennal scale broad, distally from overreaching article 4 to reaching end of article 5. Cheliped with small or obsolescent ventromesial spine on ischium. P2–4 meri and carpi unarmed; propodi not broadened distally; with row of spines, distal-most spine paired, placed close to juncture with dactulus; dactyli distally narrowed, with row of regularly arranged spines, ultimate spine longest, penultimate and antepenultimate subequal, remaining spines short and blunt, arranged parallel to flexor margin.

Colour in life. Not known.

Remarks. *Uroptychus disangulatus* Baba, 2018 was established for a small series of specimens based on shared characteristics of a carapace with a strong anterolateral spine only on the lateral margin and the

Figure 75. *Uroptychus disangulatus* Baba, 2018, male, NIWA 86189: **A.** carapace and abdomen and one egg, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** right antenna, ventral; **F.** left antenna, ventral; **G.** endopod of Mxp3, left, lateral; **H.** crista dentata of right Mxp3; **I.** right cheliped, dorsal; **J.** left cheliped ischiomerus, mesial; **K.––M.** right P2–4; **N.** P3 dactylus and distal portion of propodus, lateral. Scale bars = 2 mm.

Figure 76. Distribution of *Uroptychus disangulatus* Baba, 2018 around New Zealand.



P2–4 dactyli bearing small spines oriented parallel to the flexor margin. Other diagnostic characters presented appear to be variable in the New Zealand material; the lateral orbital spine is variably distinct or indistinct, sometimes in the same specimen (e.g. male, Fig. 75A), not always unarmed; the antennal scale is relatively wide (1.7–2.0 × broader than article 4) but not as roundly truncate or blunt as in the types, and is slightly longer (reaches or distinctly overreaching the midlength of article 5 compared to at most reaching midlength); the cheliped is shorter (3.0–3.5 × pcl compared to 4.0–4.4 in the types) and the cheliped ischium bears a ventrodistal spine in some cases, which can vary in the same specimen (versus rudimentary in the types). Otherwise, the specimens agree with the description of *U. disangulatus* but specimens from across its range might be resolved as a species complex in the future.

Uroptychus disangulatus most closely resembles *U. brevisquamatus* and *U. webberi*; they all share the distinct mesial concavity on the ocular peduncle, but both *U. disangulatus* and *U. webberi* have a pair of distalmost spines on the P2–4 propodus flexor margin (*U. brevisquamatus* has a single spine); the shape of the carapace differs with the carapace lateral margin in *U. webberi* straight divergent along the hepatic margin and subparallel along the branchial margin, versus convexly divergent posteriorly in both *U. disangulatus* and *U. brevisquamatus*; the vental surface of the cheliped merus is weakly granulose or granulose in *U. disangulatus* and *U. brevisquamatus* versus bearing a row of ventral spines in *U. webberi*.

DNA sequence data. Intraspecific levels of CO1 sequence divergence: 0.9% (two specimens). Closest interspecific divergences: 8.7–9.1% (*U. brevisquamatus* four specimens).

Uroptychus duplex Baba, 2018 Figs 77–80

Uroptychus duplex Baba, 2018: 189, figs 82, 83.

Type & locality (not examined). Holotype—MNHN-IU-2011-5923, CHALCAL 2 Stn DW73, 24°39.9′S, 168°38.1′E, Norfolk Ridge, 573 m, 2 Oct 1986, female ov. (pcl 4.7 mm).

Material examined. *West Norfolk Ridge*: NMNZ CR.022695, NORFANZ Stn TAN0308/152, 34°37.56′S, 174°57.96′E, 518–531 m, 03 Jun 2003, 1 male (4.8 mm,

Figure 77. *Uroptychus duplex* Baba, 2018 on *Parantipathes* cf. *helicosticha*, NMNZ CR.022695 (male) and CR.022696 (female), NORFANZ Stn TAN0308/152.

pcl 3.3 mm; sequenced, see Fig. 5), on *Parantipathes* cf. *helicosticha* black coral. NMNZ CR.022696, station details as above, 1 female ov. (6.0 mm, pcl 4.0).

Distribution. New Caledonia, Norfolk Ridge, West Norfolk Ridge, 518–896 m.

Habitat. The two New Zealand specimens were collected from amongst the pinnules of a *Parantipathes* black coral branch (photographed live on deck in Fig. 77 and illustrated in lateral view among pinnules of *Parantipathes* cf. *helicosticha* in Fig. 78). The body shape and leg morphology indicate that this species is a coral associate (see below).

Diagnosis. Carapace much wider than long, dorsally unarmed except for a few small scattered spines and granules in hepatic region; surface finely setose. Lateral carapace margin distinctly convex, with row of well-developed anterolateral spine and additional spines along anterior ¾ portion: 2 or 3 hepatic, 6–8 branchial; anterolateral spine largest, overreaching small lateral orbital spine, bearing distinct tufts of setae distally. Rostrum narrow triangular. Pterygostomian flap low on posterior half (height of posterior half 0.4 × that of anterior half). Sternal plastron wide; sternite 3 anterior margin shallow concave, median notch

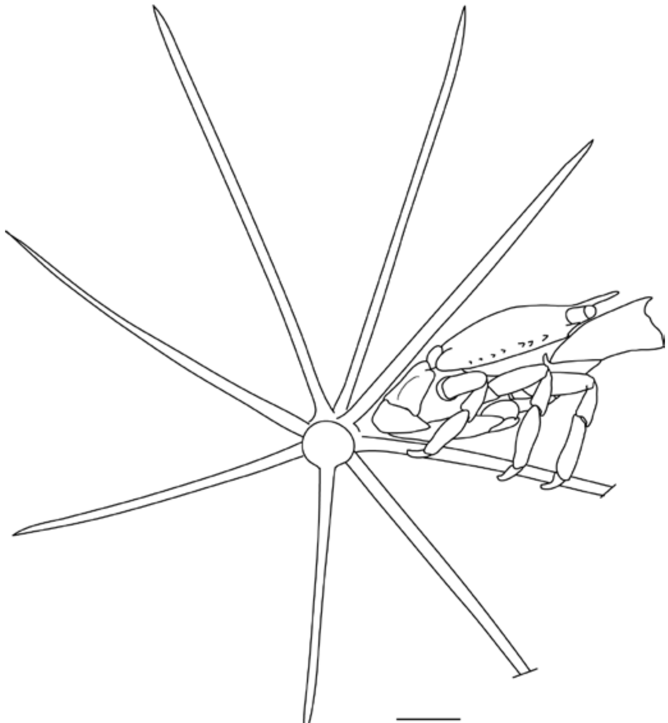


Figure 78. *Uroptychus duplex* Baba, 2018, female ov., NMNZ CR.025696, NORFANZ TAN0308/152, generalised lateral habitus placed on illustration of cross-section of *Parantipathes* cf. *helicosticha* colony.

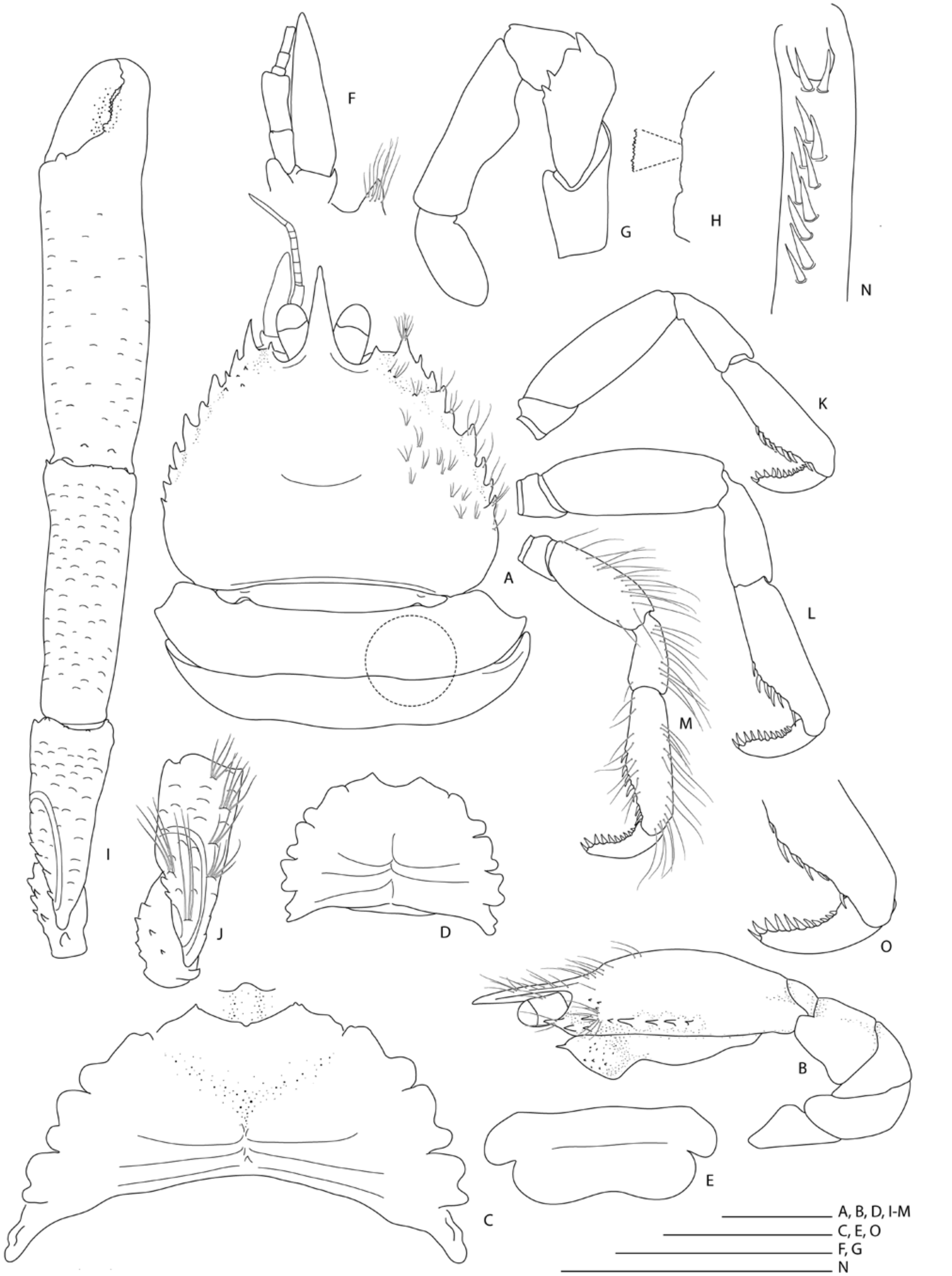
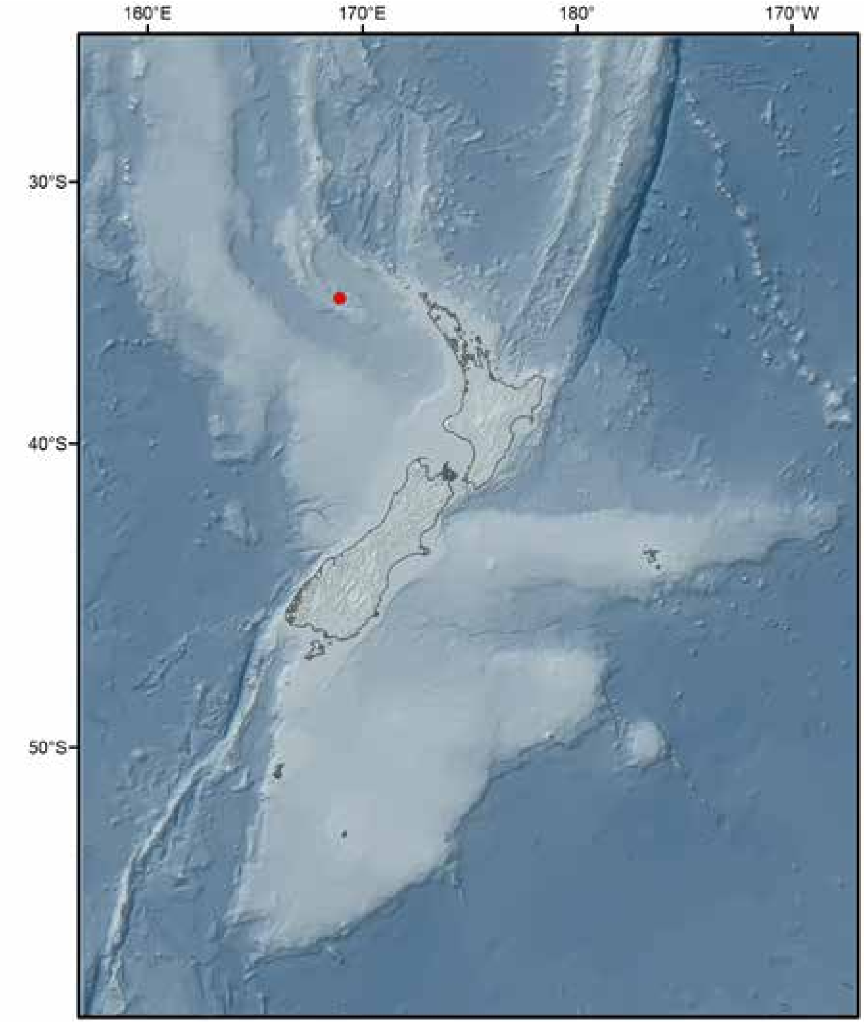


Figure 79. *Uroptychus duplex* Baba, 2018, A–C, E–O, female ov., NMNZ CR.022696, D, male, NMNZ CR.022695: **A.** carapace and abdomen and one egg, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** sternal plastron; **E.** telson; **F.** left antenna and anterolateral spine, ventral; **G.** endopod of Mxp3, left, lateral; **H.** crista dentata of left Mxp3 including closeup of central section; **I.** left cheliped, dorsal; **J.** left cheliped ischiomerus, mesial; **K–M.** right P2–4; **N.** distal portion of P4 propodus, ventral; **O.** distal portion of propodus and dactylus, P3, lateral. Scale bars = 2 mm.

Figure 80. Distribution of *Uroptychus duplex* Baba, 2018 around New Zealand.



absent or faintly indicated. Antennal article 2 with lateral spines, articles 4 and 5 unarmed; antennal scale elongate, distinctly over-reaching peduncle and rostral tip in dorsal view. Meri and carpi of P2–4 unarmed, P3 merus distinctly longer than the P2 merus; propodi with flexor margin inflated distally, with spines arranged in staggered fashion giving impression of two parallel rows, subprehensile with dactyli, terminal spines paired; dactyli tapering distally, with row of 11–13 slightly inclined, sharp triangular spines along entire margin; penultimate spine wider than ultimate, subequal in size to proximally positioned spines.

Colour in life. Pale pink to white, dark red pigmentation of antennule, pale appendages with darker pink distal tips on cheliped. A few scattered darker pink patches on dorsal carapace surface (Fig. 77).

Remarks. Slight differences compared to the types are as follows: (1) for the thoracic sternum, the anterior margin of thoracic sternite 3 is not transverse in the central portion but regularly concave in both specimens (Fig. 79). A median notch is also faintly indicated in both specimens, absent in the type series. The width-length ratio of the sternal plastron varies greatly between the sexes (1.8 × in the male and 3 × in the ovigerous female, Fig. 79C, D), Baba (2018) notes a ratio of 'slightly less than twice as broad as long'; (2) the chelipeds measured here are 4.3–5.8 × pcl, which is shorter than the type series (5.7–6.8 × pcl). Otherwise, the material conforms well, notable are the proportions of the walking legs, with P3 being distinctly longer (1.1 × longer than P2 and 1.6 × longer than P4) and the merus is also the widest (1.2–1.3 × wider on P3 than on P2 and P4). These new records extend the known range southward along the Norfolk Ridge.

The female carried 11 large eggs that filled the entire ovum, each oval to rounded and 1.6–2.0 mm in diameter.

Uroptychus duplex resembles two species recently described by Baba (2018), *U. macrolepis*, also from New Caledonia and Norfolk Ridge and *U. zigzag* from the Kei Islands (Indonesia) and Vanuatu. They share the posteriorly broadened, laterally spinose carapace, antennal scale overreaching the antennal peduncle, and inflated flexor distal margins of P2–4 propodi. *Uroptychus duplex* differs from both species by the more elongate antennal scale, overreaching the peduncle by at least another half length of the peduncle (and overreaching the rostral tip in dorsal view). It further differs from *U. zigzag* in that the carapace lateral margin is unarmed on the posterior fourth (armed along the entire length in *U. zigzag*) and the Mxp3 carpus is unarmed other than the distolateral spine (a small proximal spine on the extensor margin of carpus in *U. zigzag*). *Uroptychus duplex* differs from *U. macrolepis* in lacking a constriction along the lateral carapace midline, at the height of the cervical groove (constriction is present in *U. macrolepis*), in having more than 8 spines along the carapace lateral margin that are regularly arranged along the anterior ¾ of the carapace (*U. macrolepis* has seven spines with a distinct gap between the anterior branchial and posterior branchial spines), and in having the thoracic sternite 3 surface not excavated, with the boundary between sternites 3 and 4 barely discernible (sternite 3 surface is but distinctly shallow excavated in *U. macrolepis*).

The distal one-third of the flexor margin of P2–4 propodi in *U. duplex* is inflated and sub-prehensile with the dactyli which typically indicates an association with a coral host (Baba 2005). While Baba (2018) does not mention an association when describing this species, the two New Zealand specimens examined here were collected from among the pinnules of a *Parantipathes* black coral branch. In lateral view, and with the abdomen folded, the shape of the body of *U. duplex* matches the arrangement of branches of the black coral host (Fig. 78). The posterior carapace and first abdominal somites appear flattened and the pterygostomian flap is distinctly reduced in its posterior portion. This gives the animal a sub-triangular shape with the posterior body distinctly narrowed and it evidently allows it to retreat into the narrowing gaps between the pinnules of the black coral host.

Uroptychus duplex is so far known from the northern portion of the Norfolk Ridge and the Isle of Pines, New Caledonia. The specimens collected during the NORFANZ expedition extend the known distribution ten degrees further south to the southern West Norfolk Ridge (Fig. 80).

DNA sequence data. Interspecific sequence divergences for partial CO1 gene (NMNZ CR.022696): > 18%.

Uroptychus empheres Ahyong & Poore, 2004

Figs 81, 82

Diptychus australis Henderson, 1885: 420 (part).

Uroptychus australis, Henderson, 1888: 179 (part) [Not *U. australis* (Henderson, 1885)].

Uroptychus empheres Ahyong & Poore, 2004: 34, fig. 8; Baba 2005: 225 (synonymies, key); Baba *et al.* 2008: 32 (list and synonymies); Schnabel 2009b: 27 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list); Baba 2018: 200, figs 88, 89.

Type & locality (not examined). Holotype—NMV J52864, Andy's Seamount, Tasmania, 44°10.8′S, 147°00.0′E, 800 m, male (cl 14.4 mm).

Material examined. *Norfolk Basin (Australian EEZ)*: NIWA 23372, NZOI Stn S568, 30°10.00′S, 171°20.20′E, 650–900 m, 13 Aug 1983, 1 female ov. (8.9 mm, pcl 6.5 mm), 4 males (12.1, 8.7, 8.0, 6.9 mm, pcl 8.5, 6.1, 5.4, 4.7 mm).

Kermadec Ridge, *near L'Esperance Rock*: NIWA 119255, Kermadec-Rangitahua Stn TAN1612/125, 31°24.02–23.93′S, 178°40.29–40.38′W, 840–900 m, 03 Nov 2016, 1 male (11.7, pcl 8.1 mm, sequenced, see Fig. 5); NIWA 115191, Kermadec-Rangitahua Stn TAN1612/125, 31°24.02–23.93′S, 178°40.29–40.38′W, 840–900 m, 03 Nov 2016, 1 female (8.4 mm, pcl 6.0 mm; sequenced, see Fig. 5) (picked off coral).

Outer Bay of Plenty, *Waiotahi Knoll*: NMNZ CR.012101, NZOI Stn F880, 37°05.99′S, 177°15.49′E, 843–938 m, 4 Oct 1968, 1 female ov. (10.2, pcl 7.0 mm).

Distribution. Australia (Tasmania), Indonesia (off Banda, Kai Islands), Loyalty Islands, Norfolk Ridge, Tonga, and Solomon Islands, 281–890 m. Reported here from Norfolk Basin, Kermadec Ridge, 650–938 m (Fig. 82).

Habitat. A biological association between *U. empheres* and corals is implied, since NIWA 115192 was taken from a chrysogorgiid coral. Baba (2018) reported a specimen as 'on gorgonacean' (MNHN-IU-2014-16442).

Diagnosis. Carapace excluding rostrum slightly longer than broad; smooth and unarmed on dorsal surface; epigastric spines vestigial or absent; lateral margin irregular but unarmed; without posterolateral ridge; anterolateral spine small, reaching end of lateral orbital spine. Pterygostomian flap rounded on anterior margin, without distinct spine. Rostrum sharply triangular; about half distance between anterolateral spines at base. Thoracic sternite 3 strongly depressed, anterior margin deeply emarginate, with narrow median notch flanked by submedian spines; sternite 4 surface with transverse row of setiferous granules, with a few scattered granules across remainder; sternite 5 with distinctly convex anterolateral margin. Abdomen smooth and unarmed. Antennal article 2 with lateral spine; articles 4–5 unarmed; article 5 slightly more than twice length of article 4; antennal scale not reaching to slightly overreaching end of peduncle. Cheliped ischium without distinct ventrodistal spine; a few scattered granules on mesial and ventral surfaces of propodal palm, carpus and merus. Pereopod 2–4 meri and carpi unarmed; P4 merus much shorter (0.6 ×) and more slender (0.8 ×) than P3 merus; propodus flexor margin with distalmost spines paired, preceded by

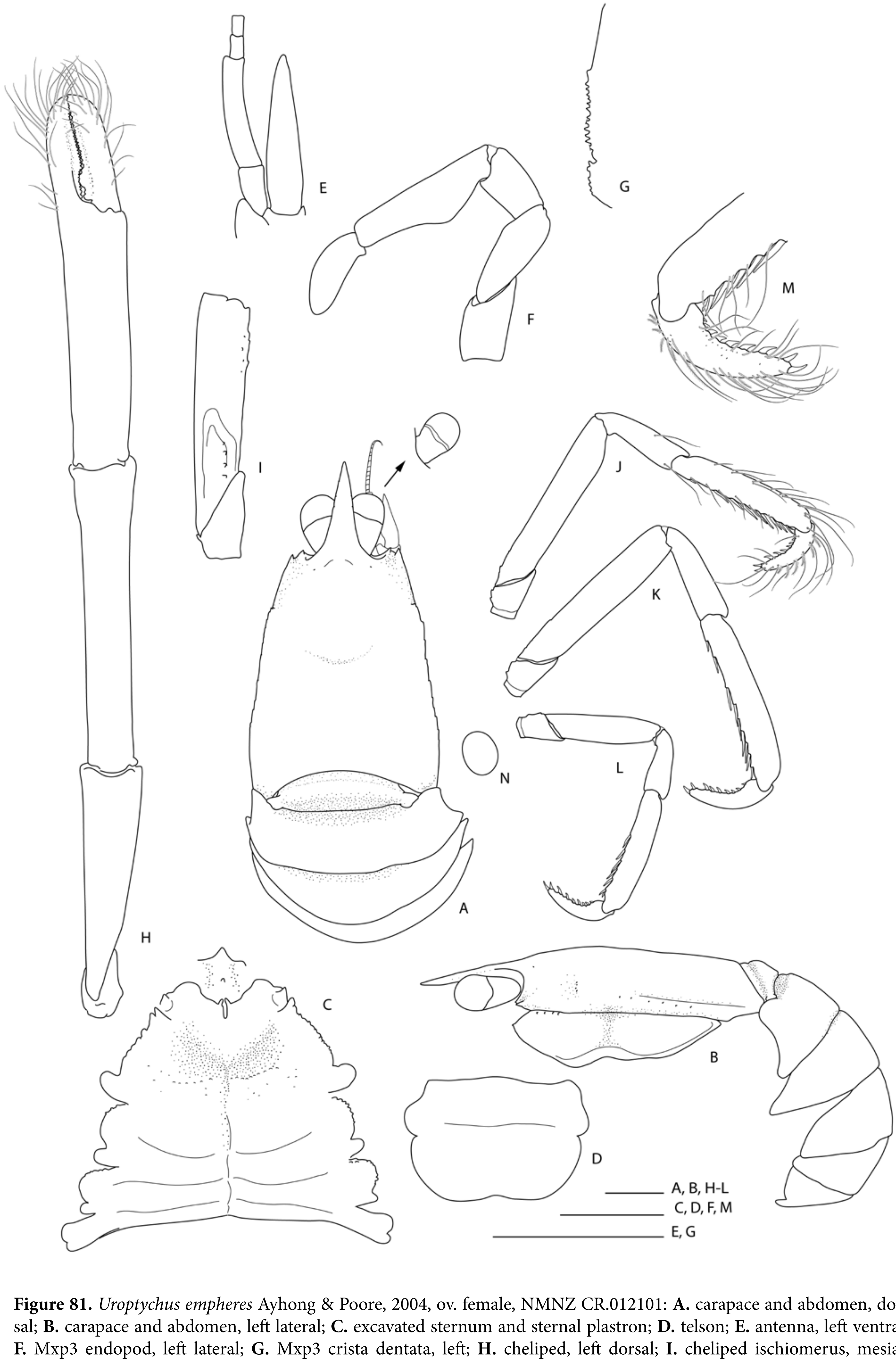
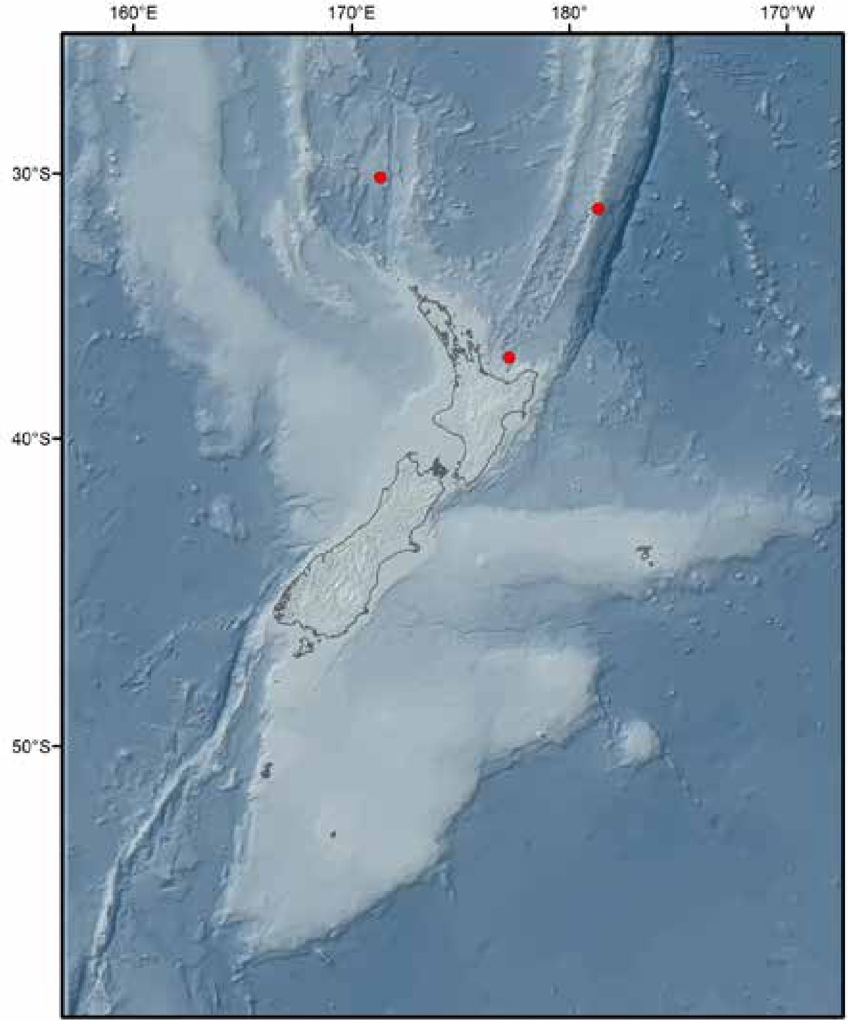


Figure 81. *Uroptychus empheres* Ayhong & Poore, 2004, ov. female, NMNZ CR.012101: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, left lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, left ventral; **F.** Mxp3 endopod, left lateral; **G.** Mxp3 crista dentata, left; **H.** cheliped, left dorsal; **I.** cheliped ischiomerus, mesial; **J–L.** P2–4, right lateral; **M.** P3 dactylus and proximal propodus, left; **N.** egg. Scale = 2 mm.

Figure 82. Distribution of *Uroptychus empheres* Ayhong & Poore, 2004 around New Zealand.



row of 4–9 spines; dactyli with 7–10 obliquely directed spines on flexor margin, ultimate and penultimate spines slightly separated from antepenultimate; ultimate spine subequal to or slightly larger than penultimate spine.

Colour in life. Not known.

Remarks. The New Zealand material of *U. empheres* includes a size range of 4.7–8.5 mm (pcl) which matches that reported by Baba (2018). Only the cl was originally reported for the Australian type series (ranging from 10.4–16.5 mm) and the specimens examined here are slightly smaller, with a range of 6.9–12.1 mm. Slight variation among the specimens is noted as follows: the epigastric region bears a minute to obsolescent pair of spines; a size-related difference is evident in the presence and extent of the granulation on both the sternite 4 surface and the cheliped ventral surface, the large specimens show distinctive granulation which progressively diminishes and becomes indistinct in small specimens. In none of the specimens is the granulation as pronounced as illustrated for the large female holotype (pcl ~10.0 mm).

Comparing the different accounts of this purportedly widespread species indicates some variability, which may indicate the presence of more than one species. However, more specimens from across the range need to be examined to confirm that distinguishing characters are stable. For example, the carapace shape of the holotype is anteriorly wider than the posterior width. Comparing the ratio of the distance between the anterolateral spines and the width between the posterolateral corners, it is 0.9 for the holotype and consistently around 0.6 for the New Zealand specimens (Fig. 81A) and 0.7 for specimens illustrated by Baba (2018). Also, the spination on the P2 propodus seems to be less in the holotype, a distal 0.7 of the flexor margin bears spines compared to > 0.8 in the specimens examined here and figured by Baba (2018). The meristics of the walking legs overlap in all other aspects. This species should be revisited in the future, ideally using molecular markers and across its range (also see comments below relating to *U. pollostadelphus* Baba, 2018).

Uroptychus empheres is unique in that the carapace dorsal and lateral margins bear no large distinct spines, the anterior margin of the pterygostomian flap is rounded and furnished with a small spine only, cheliped is unarmed except for a broad blunt dorsal spine on the ischium, and the walking legs are distinctly dissimilar with P3 longest and P4 much shorter and narrower.

Uroptychus empheres belongs to the difficult group of 'smooth' species within which relationships still are being established. In the overall body shape and the relative size and spination of the pereopods and antenna, this species is similar to *U. pollostadelphus* Baba, 2018 from Norfolk Ridge and *U. sagamiae* Baba, 2005 from Japan. Both are separated by Baba (2018) from the group containing *U. empheres* on the basis of a presence of epigastric spines in the former two, while these are noted as absent in *U. empheres*. However, it appears that this character overlaps at least in part; *U. empheres* from Tasmania occasionally has a "pair of low epigastric scales composed of transverse row of three or four minute granules" (Ahyong & Poore 2004: 36) and Baba (2018: 203) reported a "pair of epigastric scales composed of granules occasionally absent". *Uroptychus pollostadelphus* and *U. sagamiae*, both described from a single specimen, are reported as having an epigastric region with pair of "small" or "very small" spines. Considering the size of the type specimens for *U. pollostadelphus* (male, pcl 6.8) and *U. sagamiae* (female, pcl 8.8 mm), this epigastric ornamentation entirely overlaps with the range observed for *U. empheres*. The two species are further separated from each other by the presence (*U. sagamiae*) or absence (*U. pollostadelphus*) of granulation on the sternum and ventral cheliped and row of plumose setae along the extensor margin of P2–4 dactyli. *Uroptychus empheres* shares the granulation with *U. sagamiae,* and the specimens examined here have a few plumose setae present along the extensor margin of the P2–4 dactyli, albeit, not arranged as a distinct fringe. Otherwise, there do not appear to be any other characters distinguishing these species, but it is highly unlikely that the material reported from Tasmania to Japan belongs to a single species. Until then, the New Zealand specimens are referred to *U. empheres sensu lato*.

Uroptychus empheres has otherwise been aligned with *U. comptus* Baba, 1988 from Borneo but differs in the presence of a ridge along the posterolateral margin of the carapace (absent in *U. empheres*) and a sparsely granulate carapace surface (smooth except for epigastric spines or granules in *U. empheres*). It is also similar to *U. nigricapillis* and *U. terminalis*, both known from New Zealand, but both of these species have a ridge along the posterolateral margin of the carapace (no ridge in *U. empheres*), always have a distinct pair of epigastric spines (at most a pair of minute spines in *U. empheres*), and the distalmost of the P2–4 propodi flexor marginal spines is single (paired in *U. empheres*). The morphological similarities are highlighted by the fact that NMNZ CR.0120101 referred to *U. empheres* here was reported as *U.* sp. (*U. terminalis* Baba, 2018) in Schnabel (2009a) which included a mix of the three species *U. terminalis*, *U nigricapillis,* and *U. empheres*.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.0–1.3% (three specimens). Closest interspecific sequence divergences: 8.6–9.2% (*U. terminalis* (three specimens),

Uroptychus enriquei Baba, 2018 Figs 83–85

Uroptychus enriquei Baba, 2018: 204, figs 90, 91.

Type & locality (not examined). Holotype—MNHN-IU-2011-5953, BERYX 11 Stn CP53, 23°48′S, 168°17′E, Norfolk Ridge 540–950 m, 21 Oct 1992, female ov. (pcl 10.8 mm).

Material examined. *Reinga Ridge*: NMNZ CR.022701, NORFANZ Stn TAN0308/126, 33°23.41′S, 170°11.58′E, 490–526 m, 31 May 2003, 1 female (16.8 mm, pcl 11.3 mm; sequenced, see Fig. 5), 1 male (13.2 mm, pcl 9.0 mm).

Lord Howe Rise (Australian EEZ): NMNZ CR.022700, NORFANZ Stn TAN0308/51, 29°13.67′S, 159°01.15′E, 810–1000 m, 21 May 2003, 1 female (16.4 mm, pcl 11.0 mm), 1 male (15.5 mm, pcl 10.2 mm; sequenced, see Fig. 5).

Distribution. Widely distributed in the southwestern Pacific: Philippines, New Caledonia, Solomon Islands, Norfolk Ridge, off Lord Howe Island, 398–1000 m (Fig. 85).

Habitat. Baba (2018) recorded one sample of *U. enriquei* as having been collected with a chrysogorgiid gold coral which might indicate an association. Unfortunately, no information has been retained relating to the NORFANZ specimens.

Diagnosis. Carapace widening posteriorly, about as wide as long (without rostrum), smooth, with few setae or covered with fine long setae, unarmed dorsally and along lateral margin; anterolateral corner angular or with minute spine, barely reaching minute lateral orbital spine. Rostrum narrow triangular. Sternal plastron with subparallel lateral margins; sternite 3 anterolaterally acute, anterior margin with round median notch flanked by acute angle; sternite 4 anterolateral margin rounded. Antennal article 2 with blunt lateral spine or unarmed; article 4 with small or obsolescent spine, peduncle otherwise unarmed; antennal scale barely reaching midlength of article 5. P2–4 meri and carpi unarmed, P4 merus shortest; propodi with distal pair of spines only; dactyli distally narrowed, with 6 or 7 sharp triangular spines, obliquely arranged along distal two-thirds of flexor margin, penultimate spine larger than ultimate, slightly broader than antepenultimate.

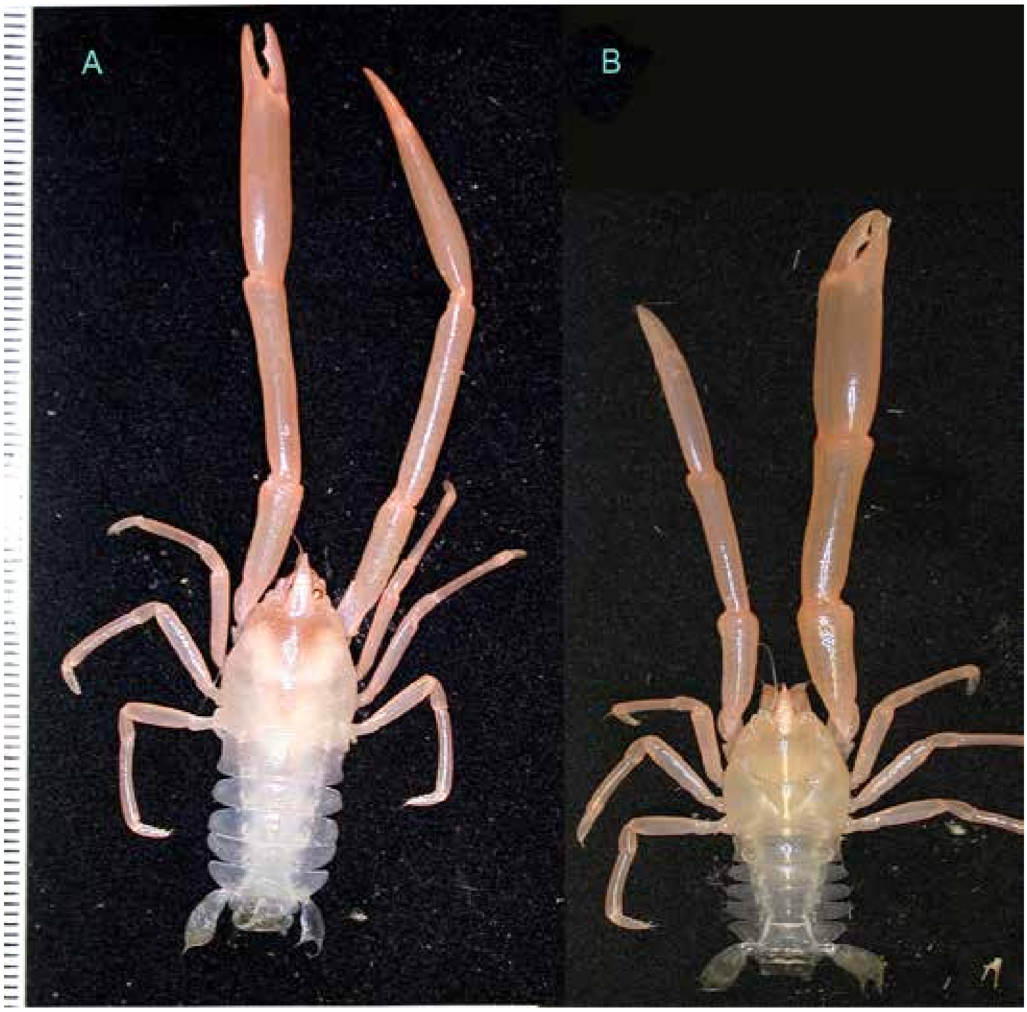


Figure 83. *Uroptychus enriquei* Baba, 2018: **A.** NMNZ CR.022700, NORFANZ Stn TAN0306/51; **B.** NMNZ CR.022701, NORFANZ Stn TAN0308/126.

Colour in life. Anterior portion of body (carapace and appendages) uniformly light pink-orange. Abdomen transparent (Fig. 83).

Remarks. Slight variations for New Zealand material of *U. enriquei* are observed with respect to the lateral spine on the antennal article 2 which can be furnished with a blunt spine (illustrated for female from station 51, Fig. 84), rounded and without a spine, or with a minute spine on a rounded corner (as seen for female CR.022701). Baba (2018) described this species as not having a spine on article 2. A small distal granule may be present or absent on the article 4, Baba (2018) noted that a distinctive distomesial spine may also be present. Another character that varies slightly from the original description is the proportion of the walking leg propodi; Baba (2018) reported a range of the length-width ratio between 5.1 and 6.5 from P2 to P4. The illustrated large female (NMNZ CR.022700, Fig. 84) has slightly more slender propodi with a range between 6.6–6.9 but the smaller male and female from NMNZ CR.022701 both have wider propodi with a range between 3.3 and 4.2 (with P4 being more robust due to reduced length). Also noted by Baba (2018) is a variation in the overall body setation, with some specimens covered with fine long setae while setation is nearly absent in others. This is apparent in the material examined here with the specimens from station 51 barely setose while the two specimens from station 126 are covered with fine long setae.

Typical sexual dimorphism in *U. enriquei* is apparent in the size and shape of the cheliped; the fingers of the males are gaping, with a distinctive median process; this is absent in females with the fingers barely gaping (Fig. 84H). The total length of the cheliped is longer in males (5.7–6.2 × pcl) than in females (4.7–5.1) but the palm may or may not be more robust. The male from station 126 has one long and comparably massive cheliped and one slender and shorter cheliped; it is presumably in the process of regrowing this appendage.

The combined characteristics of an unarmed and smooth carapace, chelipeds and the P2–4 meri and carpi unarmed, only a pair of distal spines on the P2–4 propodi, and dactyli bearing fewer than eight spines align *U. enriquei* with *U. glaber* Baba, 1981 and *U. tomentosus* Baba, 1974. *Uroptychus enriquei* differs

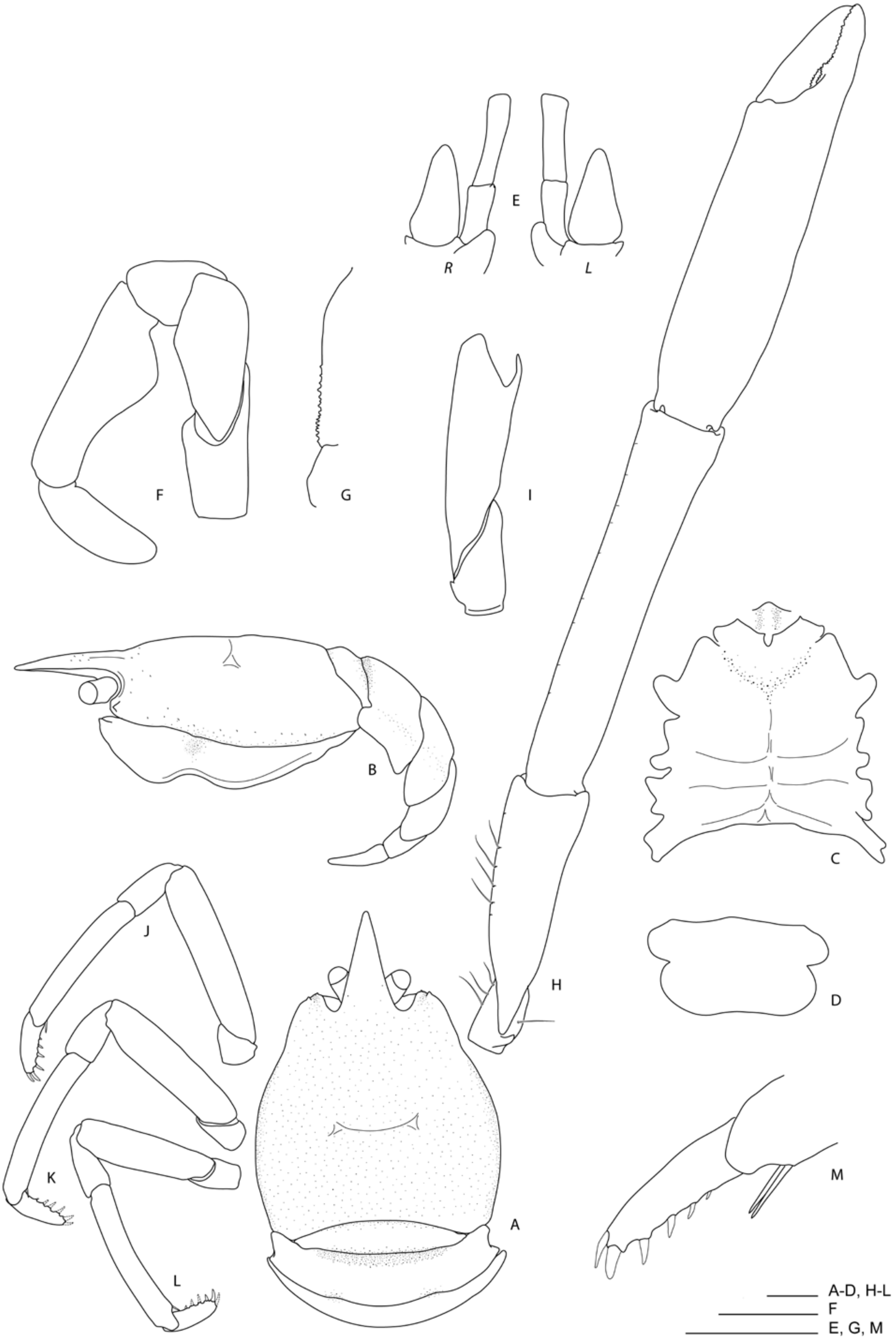


Figure 84. *Uroptychus enriquei* Baba, 2018, female, NMNZ CR.022700: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left Mxp3; **H.** right cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** left P2–4; **M.** distal portion of propodus and dactylus, P2, lateral. Scale bars = 2 mm.

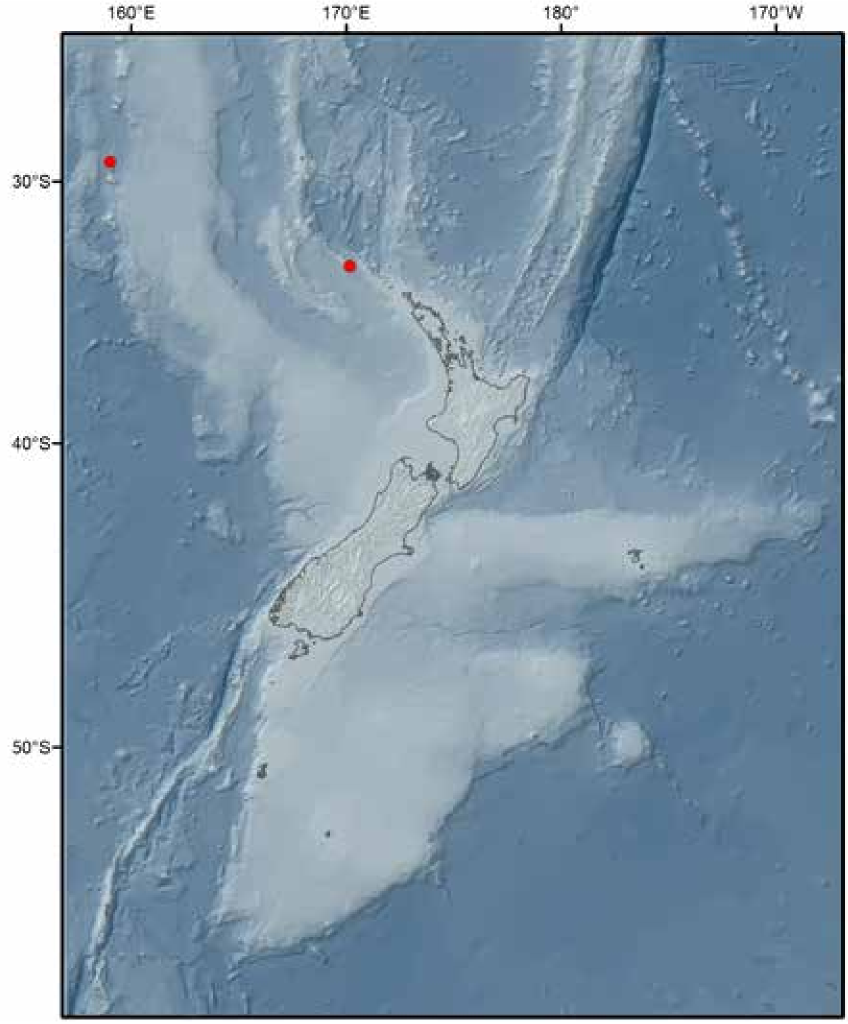


Figure 85. Distribution of *Uroptychus enriquei* Baba, 2018 around New Zealand.

more distinctly from *U. glaber* from Japan, which has a prominent anterolateral spine on the carapace (which is at most a minute spine in *U. enriquei*), the antennal scale reaches the end of antennal peduncle (at most reaches midlength of article 5 in *U. enriquei*), and the dactyli of P2–4 are longer than half propodus (shorter in *U. enriquei*). Also, the ultimate and penultimate spines on P2–4 dactyli are subequal (the ultimate spine is smaller than the penultimate in *U. enriquei*).

Uroptychus enriquei more closely resembles the common New Zealand species *U. tomentosus* with a comparably short antennal scale, six or seven spines on the P2–4 dactyli and elongate chelipeds (5–6 × pcl). *Uroptychus tomentosus* has a distinctive anterolateral spine on the carapace (at most a minute spine in *U. enriquei*); the anterolateral corner of sternite 3 is rounded in *U. tomentosus* (acute in *U. enriquei*); and the P2–4 dactyli have the penultimate of the flexor marginal spines pronounced, measuring about twice as broad as the antepenultimate (only slightly broader in *U. enriquei*). Typically, the rostrum is also distinctly rounded in *U. tomentosus* (narrowing to a point in *U. enriquei*). Genetic data appears to confirm a close association between *U. enriquei* and *U. tomentosus,* with sequence information for the CO1 gene showing higher similarity compared to other species (see below).

Uroptychus enriquei is paired with *U. rutua* Schnabel, 2009 in the key to species, which is based on the shared characteristics of the unarmed carapace with indistinct anterolateral spines, anterior sternite 3 with median notch, mostly unarmed pereopods, and the relative size proportions of the distal P2–4 dactylar spines. These two species are easily distinguished by the shape of the dorsal carapace (*U. rutua* has two distinctly inflated regions across the anterior carapace that is absent in *U. enriquei*), the pterygostomian flap surface is clearly tuberculate in *U. rutua* while smooth in *U. enriquei*, the P2–4 dactyli are much shorter in *U. enriquei* (1/3 the length of the propodi) compared to *U. rutua* (~0.5 × propodal length).

The two records of *U. enriquei* provided here from two locations on the southern Lord Howe Rise and the Norfolk Ridge extend the known distribution slightly southward and slightly deeper to 1000 m.

The female (NMNZ CR.022701) is infested with akentrogonid rhizocephalans on its body and appendages.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 1.1% (two New Zealand specimens); < 2% (MNHN paratype sequence from Norfolk Ridge, L. Corbari, pers. comm.).

***Uroptychus havre* sp. nov.** Figs 86, 87

Material examined. Holotype NIWA 24581, NIRVANA Stn TAN1213/39, 31°06.25–06.11′S, 179°05.97–05.97′W, flank of Havre Volcano, Kermadec Ridge, 1022–1034 m, 20 Oct 2012, female (11.1 mm, pcl 8.0 mm; sequenced, see Fig. 5).

Type locality. Havre Volcano, Kermadec Ridge, 1022–1034 m.

Distribution. Known only from the type locality (Fig. 87).

Habitat. Unknown.

Diagnosis. Carapace excluding rostrum slightly longer than wide; with distinct anterolateral spine; lateral margins irregular but unarmed; dorsum with pair of epigastric spines and with scattered scales and rugosities; gastric and cardiac regions well elevated. Rostrum narrow triangular. Thoracic sternite 3 anterolaterally rounded, anterior margin with broad concavity and narrow median notch; laterally with small spine. Sternite 4 with distinct lateral spine (but large process absent). Eyes with cornea dilated. Antennal article 2 with indistinct outer spine; antennal articles 4 and 5 unarmed; antennal scale distinctly overreaching article 4, articulated with article 2. Cheliped slender, subcylindrical; about 6 × pcl; merus with distodorsal spine; carpus unarmed; palm well over 2 × length of dactylus; fingers distally spooned. P2–4 similar, slender; P2 merus about as long as pcl; propodi widened on medial flexor margin bearing group of 6–8 spines, slightly separated from single distal spine; concave prehensile distal part of flexor margin absent; dactylus tapering distally, flexor margin with 10–12 spines, ultimate largest, other spines inclined, much smaller and diminishing toward base of article, penultimate close to ultimate, antepenultimate remotely equidistant between penultimate and distal fourth.

Description. Carapace: 1.2 × as long as broad (pcl), dorsally strongly convex. Dorsal surface rugose and deeply sculpted; cervical groove deep and distinct; gastric region with pair of strong epigastric spines, carapace otherwise unarmed. Lateral orbit rounded, with minute spine. Anterolateral spine well-developed; lateral margins convexly divergent posteriorly; unarmed except for irregular granulation in cardiac region; posterolateral corner with distinct ridge. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines), strongly curving dorsad, 0.4 × pcl; 1.7 × longer than wide at base; dorsal surface convex; lateral margins smooth. Pterygostomian flap with a few small granules scattered around the anterior portion; anterior margin narrow triangular and produced to spine.

Thoracic sternum: Excavated sternum with acute anterior margin and small spine on midline. Sternal plastron 1.1 × as wide as long, widening posteriorly; surface smooth. Sternite 3 anterolaterally rounded; anterior margin with median notch separating small submedian spines; laterally with small spine. Sternite 4 nearly twice as wide as sternite 3, anteriorly deeply concave, surface with transverse row of setiferous granules, midline grooved; anterolateral margin produced to tooth, not overreaching sternite 3; laterally unarmed; anterolateral margin as long as posterolateral margin. Sternite 5 anterolateral margin serrated.

Abdomen: Tergites smooth and unarmed. Tergite 1 with transverse ridge; tergites 2–4 without transverse ridges or grooves. Pleural margins of somites 2–4 rounded. Telson 1.6 × as broad as long; posterior margin rounded; posterior portion 1.9 × length of anterior portion.

Eyes: Smooth. Cornea globular, strongly dilated.

Antennal peduncle: Article 2 angular, with indistinct spine. Antennal article 3 unarmed. Articles 4–5 unarmed. Article 5 1.8–1.9 × as long as article 4. Antennal scale slightly overreaching article 4; 4.5–4.7 × as long as wide; articulated with article 2.

Maxilliped 3: Coxa unarmed. Basis with denticle or spine along mesial ridge. Ischium without distal spines; crista dentata with 7–10 small denticles, otherwise unarmed.

Cheliped: Slender; about 6 × pcl; surface smooth. Ischium with small distodorsal spine, ventrally unarmed. Merus surface smooth and unarmed; with distodorsal spine. Carpus surface smooth and unarmed; length 1.2 × that of palm. Palm width 8 × length, unarmed. Dactylus 0.4 × as long as propodus; occlusal margins denticulate, with slight gape, fingers spooned distally.

Pereopods 2–4: Similar; surface slightly setose. Merus and carpus unarmed; shortest merus on P4; merus 1.4 × as long as propodus. Carpus 0.8–0.9 × length of propodus. Propodus extensor margin smooth; flexor margin slightly inflated medially, with 6–8 spines along distal half; distally with pair of spines, slightly remote from next proximal spine, not distinctly concave; 1.6 × as long as dactylus. Dactylus curved; flexor margin with 10–12 movable spines along entire length, arranged nearly parallel to flexor margin and diminishing in size toward base of article;

Figure 86. *Uroptychus havre* **sp. nov.**, holotype, female, NIWA 24581: **A.** carapace and abdomen, dorsal, setae omitted; **B.** carapace and abdomen, lateral, setae omitted; **C.** excavated sternum and sternal plastron, coxae of Mxp1 and 3 included; **D.** telson; **E.** antennas, ventral; **F.** Mxp3 endopod, left, ventral; **G.** crista dentata; **H.** right cheliped, dorsal; **I.** right cheliped ischiomerus, lateral; **J.** left pereopod 2, setae omitted; **K–L.** dactylus and distal portion of propodus of right pereopod 2 and 4, lateral. Scale bars = 2 mm.

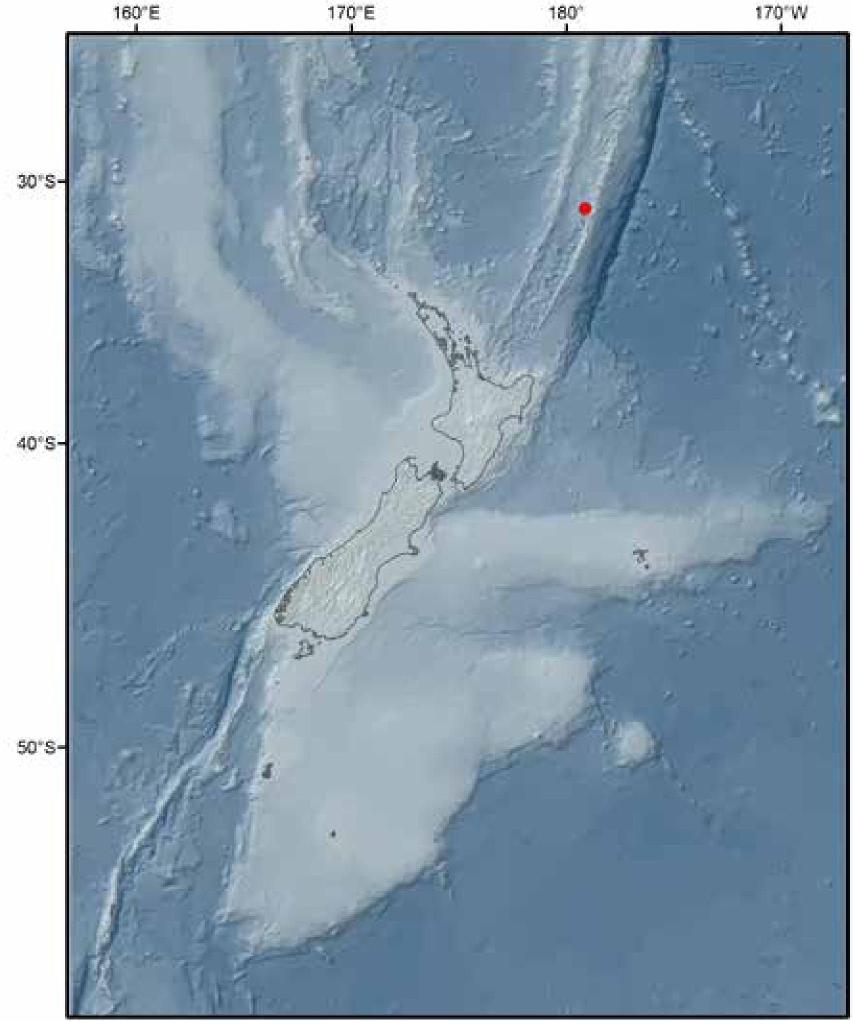


Figure 87. Distribution of *Uroptychus havre* **sp. nov.** around New Zealand.

ultimate spine distinctly larger than penultimate spine; antepenultimate spine remotely placed.

Colour in life. Not known.

Etymology. Named after the type locality, Havre Volcano on the Kermadec Ridge (Wright *et al*. 2006); used as a noun in apposition.

Remarks. The single female of *U. havre* **sp. nov.** collected from the western flank of Havre volcano (NIWA 24581) is similar to *U. thermalis* Baba & de Saint Laurent, 1992 in the overall carapace and pereopod morphology but is morphologically and genetically distinct. *Uroptychus havre* **sp. nov.** bears a distinct pair of epigastric spines, the antennal article 2 that is angular and unarmed laterally, the antennal scale overreaches the antennal article 4, and the palm of the cheliped is 2.6 × the length of the finger, as opposed to under twice as long as in *U. thermalis* (but the single specimen described here as new is a small female and this last character is regarded as subject to sexual dimorphism and allometric variation). Further variation is evident in the distribution of P2–4 propodal and dactylar spines: *U. thermalis* has a group of three to five spines distinctly remote from the single terminal spine along a medially inflated and distally concave P2–4 propodal flexor margin. *Uroptychus havre* **sp. nov.** has a similarly shaped pereopod, which is wider medially but the larger number of spines (six to eight) is less remote from the terminal spine at the juncture with the dactylus and lacks the concave distal margin (Fig. 86K, L). The spination of the P2–4 dactyli is also distinct: in *U. thermalis* the distal pair of spines is followed by a large gap and a group of six very small, inclined spines discernible only under high magnification in the proximal half. In *U. havre* **sp. nov.** the shape of the spines is the same with distal two larger spines and a group of seven or eight inclined spines, but all walking legs have the antepenultimate spine remotely placed, equidistant between the distal pair and the fourth proximal spine.

Considering the presence of the epigastric spines, *U. havre* **sp. nov.** is also allied with *U. sternospinosus* Tirmizi, 1964 from the Maldives, *U. jiaolongae* Dong & Li, 2015 from the China Sea and *U. adnatus* Baba, 2018 from Vanuatu. *Uroptychus sternospinosus* also has a strongly rugose carapace, but it differs in a distinct longitudinal carina at the midline (absent in *U. havre* **sp. nov.**); the P2–4 carpi are longer than the propodi (shorter, with the carpi 0.8–0.9 × length of propodi in *U. havre* **sp. nov.**) and propodi have the same concave prehensile edge along the distal margin as in *U. thermalis* (absent in *U. havre* **sp. nov.**). The latter two (*U. jiaolongae* and *U. adnatus*) have distinct spines along the lateral carapace margin, at least at the anterior margin of the branchial region, and the anterolateral margins of sternite 4 are rounded anteriorly and do not bear a spine (which is present in *U. havre* **sp. nov.**, *U. thermalis* and *U. sternospinosus*). *Uroptychus havre* **sp. nov.** differs from all these species in the P2–4 dactylar spination described above.

DNA sequence data. Interspecific sequence divergences for partial CO1 gene: > 10% for all other sequences available.

ZooBank registration. *Uroptychus havre* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:81F4CEA7-B601-4D49-830B-89022DAAD710.

Uroptychus helenae sp. nov. Figs 88, 89

Material examined. Holotype NIWA 115190, NZOI Stn I96, 32°15.8′S, 167°21.2′E, Wanganella Bank, 356 m, 25 Jul 1975, female ov. (4.0 mm, pcl 2.9 mm). **Paratypes** *Northern Wanganella Bank (Australian EEZ)*: AM P.102310 (ex NIWA 23371), locality details same as for holotype, 1 male (3.4 mm, pcl 2.5 mm). *Lord Howe Ridge (Australian EEZ)*: NIWA 23370, NZOI Stn Q70, 26°59.7′S, 159°18.9′E, Argo Bank, 376 m, 02 Jun 1978, 1 male (3.3 mm, pcl 2.4 mm).

Type locality. Wanganella Bank, 356 m.

Distribution. Lord Howe Ridge and Wanganella Bank, 356–376 m (Fig. 89).

Habitat. A range of large invertebrates including chrysogorgiid gold corals were collected together with *U. helenae* **sp. nov.**; therefore, a cnidarian association is likely.

Diagnosis. Dorsal carapace regions distinct, posterior branchial margin slightly inflated but not prominent; pair of large protogastric eminences furnished with transverse row of granules anteriorly, epigastric and hepatic regions finely denticulate, otherwise unarmed. Lateral carapace finely denticulate, without large spines, anterior branchial margin with prominent process, with transverse row of granules anteriorly. Anterolateral spine subequal in size to lateral orbital spine, bases contiguous in dorsal view. Rostrum narrow triangular (breadth < 0.5 × distance between anterolateral spines), with round apex. Thoracic sternite 3 with median notch on anterior margin, flanked with minute submedian spines. Abdominal tergites and pleura unarmed. Antennal articles 4 and 5 each with broad, blunt distal spines (spine on article 5 may be indistinct). P2–4 meri dorsally serrated; meri, carpi and propodi otherwise unarmed (propodi with distal pair of flexor margin spines only); P3 and P4 meri subequal in length; carpi shorter than dactyli; dactyli distally narrowed (not truncate); with 7 or 8 sharp triangular spines along flexor margin, arranged perpendicular to margin; ultimate spine minute, penultimate largest, about twice size of antepenultimate spine.

Description. Carapace: pcl 0.9 × width, moderately convex from side to side. Dorsal surface granulose and moderately sculptured; cervical groove deep and distinct; gastric region with row of many epigastric spinules; protogastric region with two lateral elevated processes, bearing anterior row of granules; hepatic region covered with small spines; rest unarmed. Lateral orbital spine sharp. Anterolateral spine subequal size to but not reaching tip of lateral orbital spine; lateral carapace margins slightly convexly divergent posteriorly, serrated with about 15 small spines and short rows of granules; hepatic region with 3 or 4 small lateral spines; anterior branchial region with prominent elevated process (with anterior transverse row of granules); posterior branchial region irregular with distinct serrations and granules; posterolateral corner with distinct ridge. Rostrum narrow triangular (breadth < 0.5 × distance between anterolateral spines), rounded distally, horizontal, about 0.4 × pcl; 1.3 × longer than wide at base; dorsal surface excavated; lateral margins smooth. Pterygostomian flap covered with spines or spinules; anterior margin produced into spine.

Thoracic sternum: Excavated sternum with convex anterior margin and low ridge on smooth midline. Sternal plastron 1.1 × as wide as long; sternites 5–7 laterally subparallel; surface smooth. Sternite 3 anterolaterally rounded, with pair of minute spines; anterior margin with median notch separating submedian spines; lateral corner with broad spine. Sternite 4 width 2 × as wide as sternite 3, anteriorly shallow concave, midline grooved; anterolateral margin with blunt terminus [very small granule on apex on left side]; laterally unarmed; anterolateral margin length subequal to posterolateral margin. Sternite 5 anterolateral margin unarmed, rounded.

Abdomen: Tergites with tufts of long setae, all tergites unarmed, without ridges. Pleural margins of somites 2–4 rounded. Telson width 1.9 × length; posterior margin nearly straight or weakly emarginate; posterior portion length nearly 1.7 × length of anterior portion.

Eyes: Sparsely setose. Cornea distally slightly narrowed, nearly 0.4 × length of ocular peduncle.

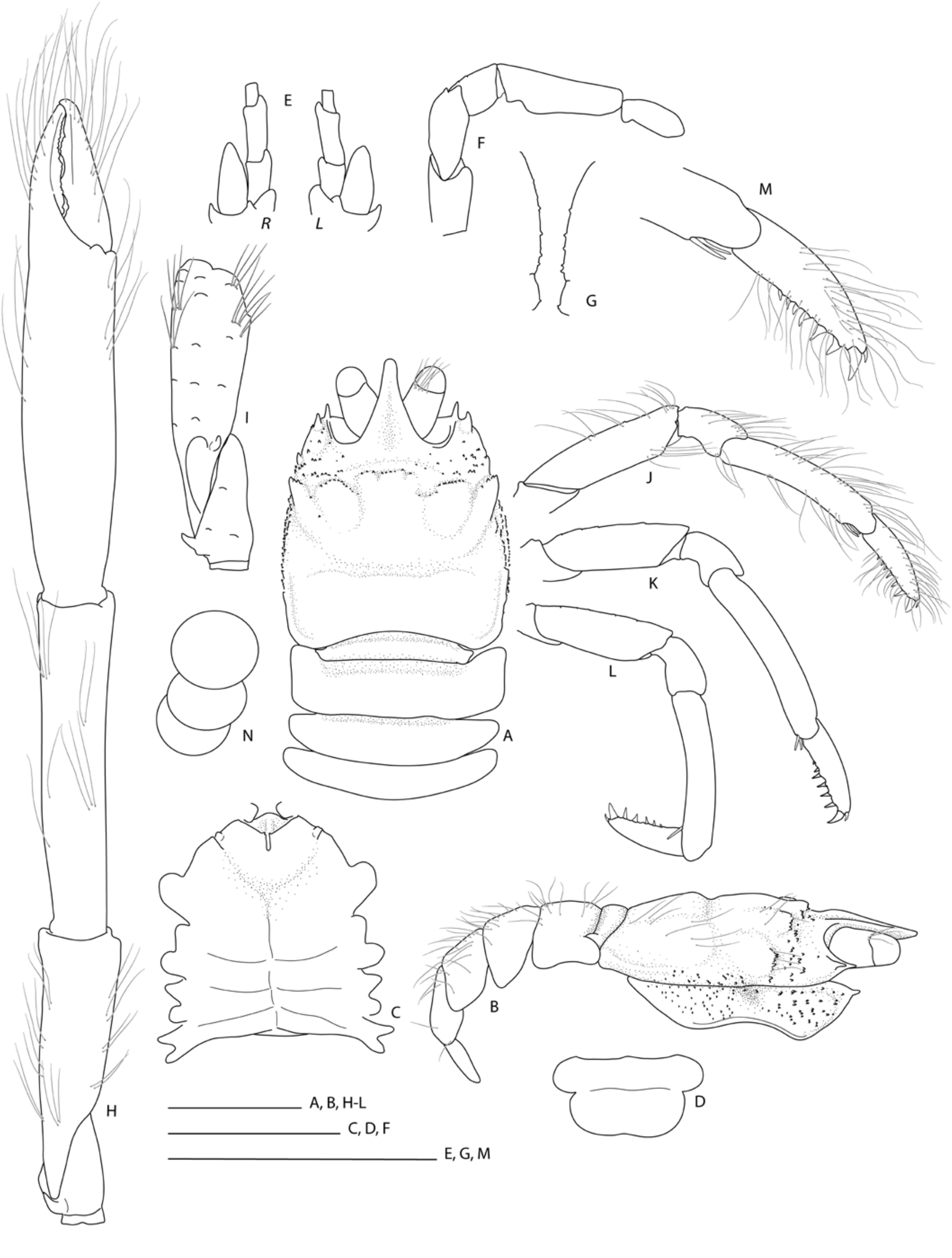


Figure 88. *Uroptychus helenae* **sp. nov.**, holotype female ov., NIWA 115190: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antennae, right and left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of left and right Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and cactylus, P2, lateral. Scale bars = 2 mm.

Antennal peduncle: Article 2 with distinct outer spine. Antennal article 3 unarmed. Article 4 with small but distinct distal spine or [rounded and more lobe-like]; mesial margin unarmed. Article 5 with small distal spine or [rounded lobe], mesial margin unarmed; length 1.1–1.5 × [1.3, 1.5] that of article 4. Antennal scale varying from slightly overreaching article 4 to nearly reaching midlength article 5; 2.1–2.6 × [2.1, 2.3] as long as wide.

Maxilliped 3: Coxa unarmed. Basis with single denticle on mesial ridge. Ischium without distal spines; crista dentata with 5 or 6 denticles and few small granules. Merus extensor margin with small distal spine; flexor margin without spine. Carpus, propodus and dactylus unarmed except for a few irregularities on extensor margin of carpus.

Cheliped: Slender; 5.4–[5.8] × pcl; surface covered with long fine setae. Ischium with distodorsal spine, ventrally smooth. Merus surface smooth, unarmed; distally unarmed. Carpus surface smooth and glabrous; unarmed distally; length subequal to that of palm. Palm 3.3–3.4 × as long as wide, setose. Dactylus 0.4–0.5 × as long as palm; occlusal margins denticulate; with slight gape.

Pereopods 2–4: Similar; surface setose. Merus 0.8 × as long as propodus; P4 merus shortest, 0.9 × as long as P2 merus; dorsal margin proximally irregular, with 3 or 4 setose granules; ventral margin unarmed. Carpus dorsal margin unarmed; without dorsolateral spines distally. Propodus 5.7–6.2 × longer than wide; extensor margin smooth; flexor margin not inflated distally, with only distal pair of spines; 1.9–2.1 × as long as dactylus. Dactylus nearly straight; flexor margin with 7 or 8 movable spines along distal two-thirds; ultimate spine small, other spines sharp triangular, perpendicular to margin, penultimate spine prominent, twice as broad as antepenultimate, close to ultimate; spines loosely and regularly arranged.

Ovum. Six eggs of 1.0–1.2 mm diameter.

Colour in life. Unknown.

Etymology. Named after Helen Kettles with thanks for her friendship and in acknowledgment of her contributions to New Zealand estuarine and marine science.

Remarks. The specimens of *U. helenae* **sp. nov.** examined are all small (pcl 2.4–2.9 mm) and share the distinctive carapace sculpturing. They match in nearly all characters; slight variation in the proportion of the cheliped is most likely size related; the slightly larger female holotype has a larger cheliped (5.8/5.9 × pcl, palm length-width ratio is 3.4/3.9, for right and left, respectively) compared to the male (5.4 × pcl, palm length-width ratio 3.3); the chelipeds of the second male are missing. The ornamentation of the antennal peduncle varies slightly, the holotype with articles 4 and 5 each bearing a broad distal lobe (Fig. 88E, not a more typical acute spine); the male paratype (AM P.102310) only has a minute distal granule instead.

Uroptychus helenae **sp. nov.** belongs to a group of small species that includes *U. rutua* Schnabel, 2009, *U. toka* Schnabel, 2009, *U. turgidus* Baba, 2018, and *U. volsmar* Baba, 2018. This group of species shares the following features:

- the carapace lacking distinct spines but having denticles along the lateral margins, on parts of the gastric and hepatic regions dorsally and on the pterygostomian flap;
- the lateral orbital spine is distinctly larger or slightly larger than and always overreaches the anterolateral spine and they are contiguous at the base;
- setose pereopods;
- the chelipeds lack distinct spines apart from a dorsal spine on the ischium (verntromesially unarmed) and the walking legs that bear a few serrations on the meri at most. The propodi only bear a distal pair of spines, the dactyli are longer than the carpi and nearly straight and bear six to eight sharp triangular spines that are arranged perpendicularly to the flexor margin, and with the ultimate spine much smaller than the penultimate (and smaller than the antepenultimate).

The main distinguishing features among species of this group are the relative size of the lateral orbital spine compared to the anterolateral carapace spine (subequal in size in *U. helenae* **sp. nov.** and *U. volsmar* and lateral orbital spine larger in *U. rutua*, *U. toka* and *U. turgidus*) and the distribution of denticles or spinules on the dorsal carapace (epigastric and hepatic denticles present in *U. helenae* **sp. nov.**, *U. rutua* and *U. toka*, absent in *U. turgidus* and *U. volsmar*). Most distinctly, *U. helenae* **sp. nov.** differs from all of the congeners in having prominent eminences that are clearly elevated above the integument in the lateral anterior branchial region, and in having the protogastric and epigastric regions distinctly elevated above the rostrum. Additionally, the cervical groove is deep and distinct, and the cardiac region is slightly inflated. *Uroptychus rutua* has broad gastric eminences but it lacks the processes along the lateral branchial margin and the deep cervical groove, *U. toka* does not have gastric or branchial eminences and the cardiac region is not inflated, *U. turgidus* has a distinctly inflated cardiac region but the epigastric region is not elevated above the rostrum and processes are absent in the gastric or branchial region, *U. volsmar* is also entirely unarmed and smooth in the gastric and branchial regions and the cardiac region is not distinctly inflated. The overall shape of the carapace and the pereopods also aligns *U.*

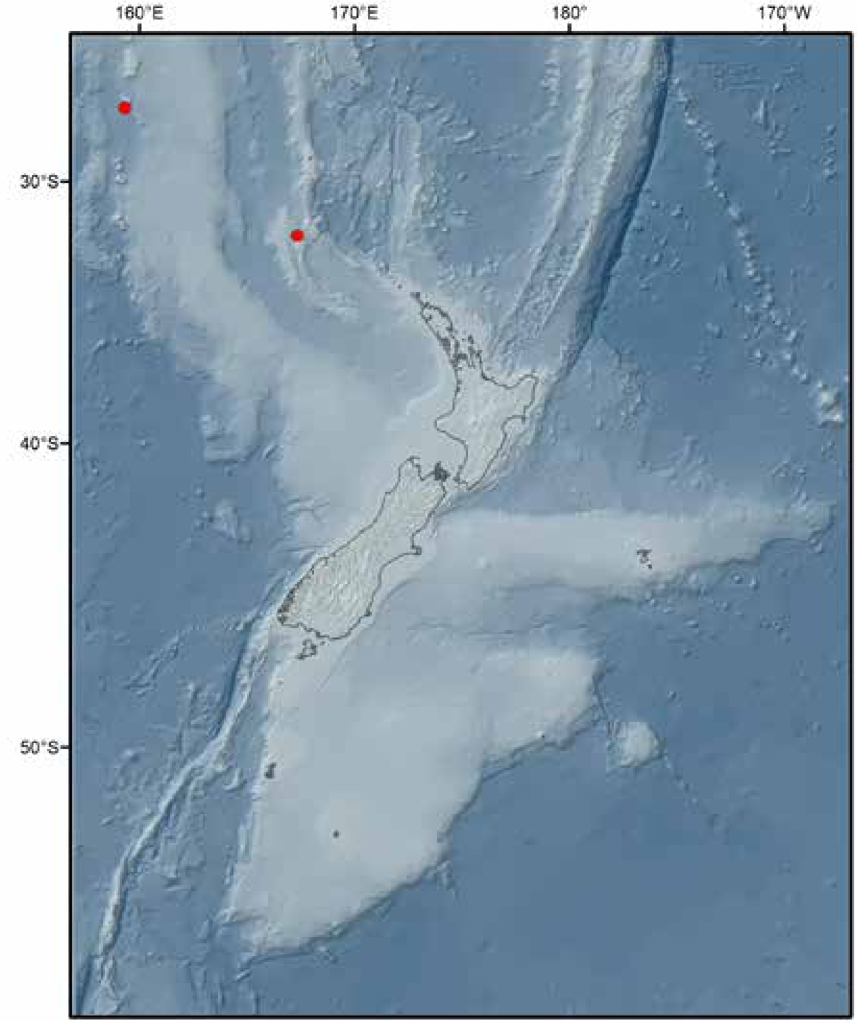


Figure 89. Distribution of *Uroptychus helenae* **sp. nov.** around New Zealand.

helenae **sp. nov.** with *U. kaitara* Schnabel, 2009. The differences are discussed under the account of that species below.

Uroptychus helenae **sp. nov.** is known from the ridges northwest of New Zealand (Fig. 89), which overlaps in some respects with the other species of the group: *U. rutua* is only known from the Kermadec region (165–180 m), *U. turgidus* from the Chesterfield Islands (265 m) and *U. volsmar* is known from the Hunter and Matthew and Loyalty Islands (373–500 m). In contrast, *U. toka* is more widespread from the Kermadec Islands to Vanuatu, Loyalty and Norfolk Ridges (304–450 m).

The specimens of *U. helenae* **sp. nov.** are not suitable for DNA sequencing.

ZooBank registration. *Uroptychus helenae* Schnabel, 2020 is registered in ZooBank urn:lsid:zoobank.org:act:AABEF654-A747-48C5-BABC-5B3438E28B91.

Uroptychus ihu sp. nov. Figs 90, 91

Material examined. Holotype NMNZ CR.022681, NORFANZ Stn TAN0308/44, 26°23.53′S, 167°10.87′E, Northern Norfolk Ridge, Australian EEZ, 1022–1028 m, 18 May 2003, female ov. (8.4 mm, pcl 4.7 mm; sequenced, see Fig. 5). **Paratypes** *Northland Plateau, South Cavalli Seamount*: NIWA 3613, NIWA Stn KAH0204/40, 34°09.86–09.84′S, 173°57.84–58.33′E, 820–805 m, 18 Apr 2002, 1 male (9.9 mm, pcl 5.6 mm). *Hikurangi Margin*, *Ritchie Bank*: NIWA 68804, NIWA Stn TAN1003/45, 39°47.05′S, 178°21.82′E, 830 m, 24 Mar 2010, 1 female ov. (pcl ~5.0 mm, carapace and rostrum damaged; sequenced, see Fig. 5).

Type locality. Northern Norfolk Ridge, 1022–1028 m.

Distribution. Norfolk Ridge, Cavalli Seamount, Ritchie Bank, Hikurangi Margin, 805–1028 m (Fig. 91).

Habitat. The holotype was collected with a branch of a large bamboo coral, suspected to be a species of either *Lepidisis* Verrill, 1883 or *Keratoisis* Wright, 1869. Collection records for the other specimens indicate the presence of both, and other large gorgonians, at all stations where *U. ihu* **sp. nov.** has been collected.

Diagnosis. Carapace smooth laterally and dorsally; anterolateral spine distinct, directed mesially, reaching same level as small lateral orbital spine. Rostrum very long, 0.8 × pcl, slightly or strongly upturned dorsally.

Sternite 3 anterolaterally rounded, anterior margin with deeply V-shaped excavation lacking distinct median notch. Mxp3 entirely unarmed, crista dentata of ischium and basis smooth. Antennal scales short, barely reaching mid-length to nearly reaching end of article 5. P2–4 meri and carpi unarmed; meri progressively shorten posteriorly; propodi entire on flexor margin; dactyli distally tapering (not truncate), length two-thirds that of propodi, flexor margin with 9 or 10 sharp triangular spines, directed slightly proximally along margin, ultimate spine very small, penultimate spine largest, slightly wider than antepenultimate.

Description. Carapace: pcl 0.9 × width, moderately convex from side to side. Dorsal surface smooth, sparsely and finely setose, unarmed; cervical groove indistinct, faintly indicated. Lateral orbital spine small. Anterolateral spine well-developed, directed mesially, reaching or slightly overreaching apex of lateral orbital spine, bases nearly contiguous; lateral carapace margin convexly divergent posteriorly; unarmed. Rostrum distally spiniform, upturned dorsally; 0.8 × pcl; 2.4 × longer than wide at base; dorsal surface smooth, convex, not setose; lateral margins smooth. Pterygostomian flap smooth; anterior margin rounded, unarmed.

Thoracic sternum: Excavated sternum anteriorly rounded and with smooth midline. Sternal plastron 1.5 × as wide as long, widening posteriorly; surface smooth. Sternite 3 anterolaterally rounded, anterior margin deeply excavated, V-shaped. Sternite 4 1.8 × as wide as sternite 3; surface with median row of setae; anterolateral margin round, smooth, as long as posterolateral margin; laterally unarmed.

Abdomen: Tergites smooth and unarmed. Pleural margins of somites 2–4 rounded. Telson 2.8 × as broad as long; posterior margin emarginated; posterior portion 2.7 × length of anterior portion.

Eyes: Smooth. Cornea subglobular, 0.5 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct blunt outer spine; otherwise unarmed; article 5 1.4–1.5 × as long as article 4. Antennal scale barely reaching midlength or reaching end of penultimate segment; 2.0 × as long as wide.

Maxilliped 3: Coxa unarmed. Basis and crista dentata smooth, unarmed. Endopod unarmed on all articles.

Cheliped: Slender; [4.5]–5.4 × length of pcl; surface smooth, sparsely setose. Ischium with small dorsal distal spine. Merus and carpus surface smooth and unarmed; carpus 1.0–[1.2] × as long as palm. Palm 4.0–[4.8] × as long as wide. Dactylus 0.3–[0.4] × as long as propodus; occlusal margins denticulate; at most with slight gape.

Pereopods 2–4: Similar; surface slightly setose. Merus dorsal margin unarmed. P4 merus shortest, 0.8 × as long as P2 merus. P2–4 meri successively shorter posteriorly, 1.0–0.8 × as long as propodi. Carpus dorsal margin unarmed. Propodus 5.1 × longer than wide; extensor margin smooth; flexor margin not inflated, without spines; 1.6 × as long as dactylus. Dactylus gently curved; densely furnished with fringe of setae; flexor margin with 9 or 10 loosely arranged spines along distal 0.8 length, ultimate very small, remaining spines sharp triangular, directed proximally, penultimate spine slighter broader than proximal spines.

Ovum. Four eggs of 1.3 mm diameter (CR.022681).

Colour in life. Not known.

Etymology. Named *ihu*, the Māori term for 'nose', a reference to the long rostrum in this species. Used as noun in apposition.

Remarks. Three specimens of *U. ihu* **sp. nov.** were collected from the northern Norfolk Ridge to the Hikurangi Margin (Fig. 91) and the two specimens at either extreme of its distribution were genetically nearly identical (see below). This species is distinctive with its long rostrum (length 0.8 × pcl), unarmed carapace, abdomen, pterygostomian flap and pereopods as well as the round anterolateral margin on the sternum with anterior V-shaped excavation that lacks a distinct median notch. The antennal article 2 has a distinct spine, but the peduncle is otherwise unarmed, and the scale is very short. Variation between the specimens includes the rostrum being distinctly upturned dorsally in the holotype but less so in the male paratype (NIWA 3613); the length of the antennal scale ranges from reaching to mid-length of article 4 (as illustrated for the holotype) to nearly reaching the end of article 4 (paratype NIWA 3613); and the cheliped-carapace length ratio ranges from 4.5 (holotype, smaller female), 5.0 (paratype, larger female) to 5.4 (largest male).

The female from Ritchie Bank (NIWA 68804) was damaged during the collection, with the carapace cracked, but it also has a truncated rostrum that appears to be in the process of regrowing.

The arrangement of the spines along the P2–4 dactylar margin in *U. ihu* **sp. nov.** is unusual for the genus. Typically, the spines are either arranged parallel to the margin, perpendicularly or obliquely inclined distally. In *U. ihu* **sp. nov.**, however, the spines are inclined towards the proximal end of the dactylus (Fig. 90M). This, in conjunction with the concave flexor margin of the propodi, could assist in gripping the branches of a host coral (see above).

Uroptychus ihu **sp. nov.** is most like *U. cylindropus* Baba, 2018, which was reported from the Loyalty Islands and New Caledonia and a slightly shallower

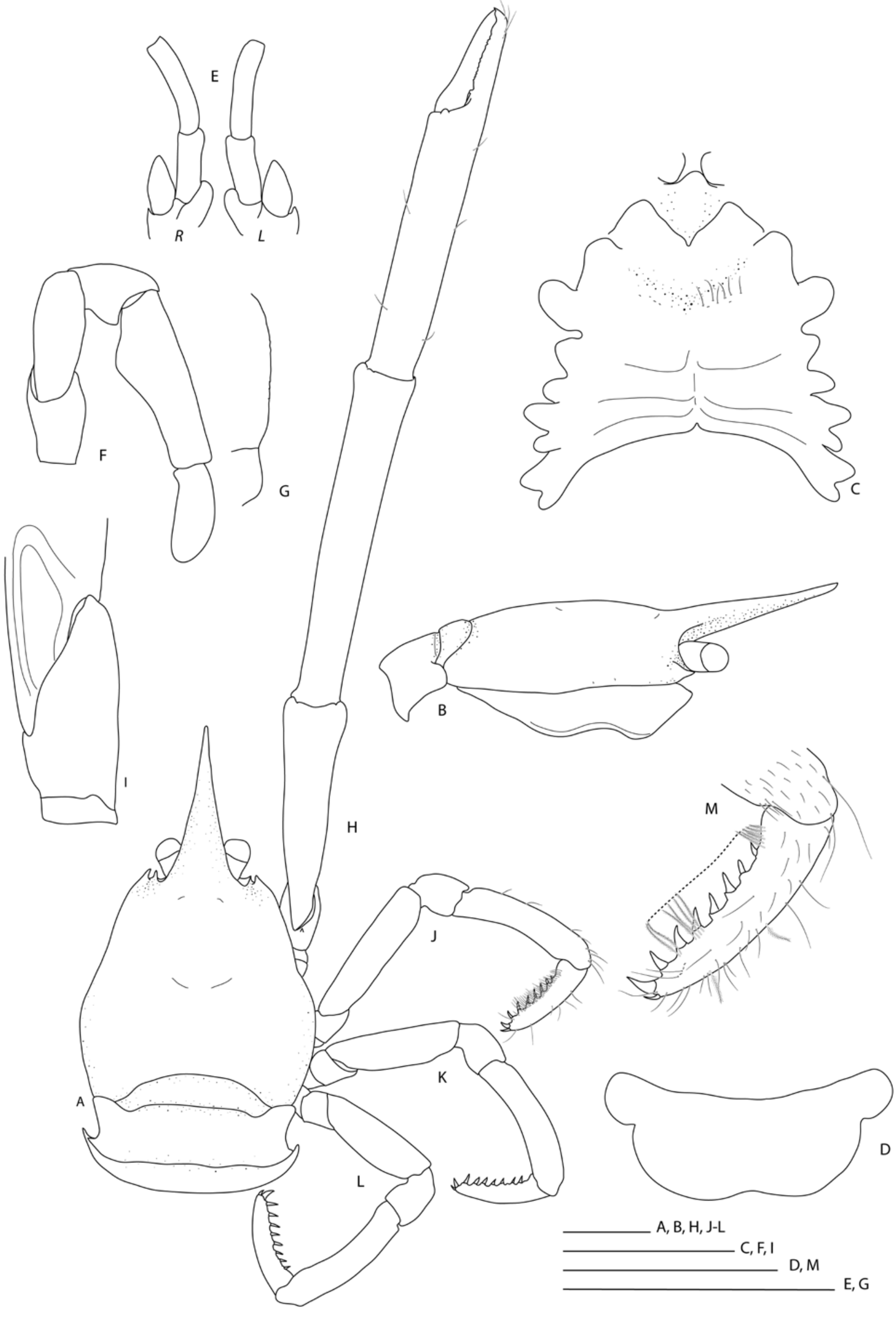
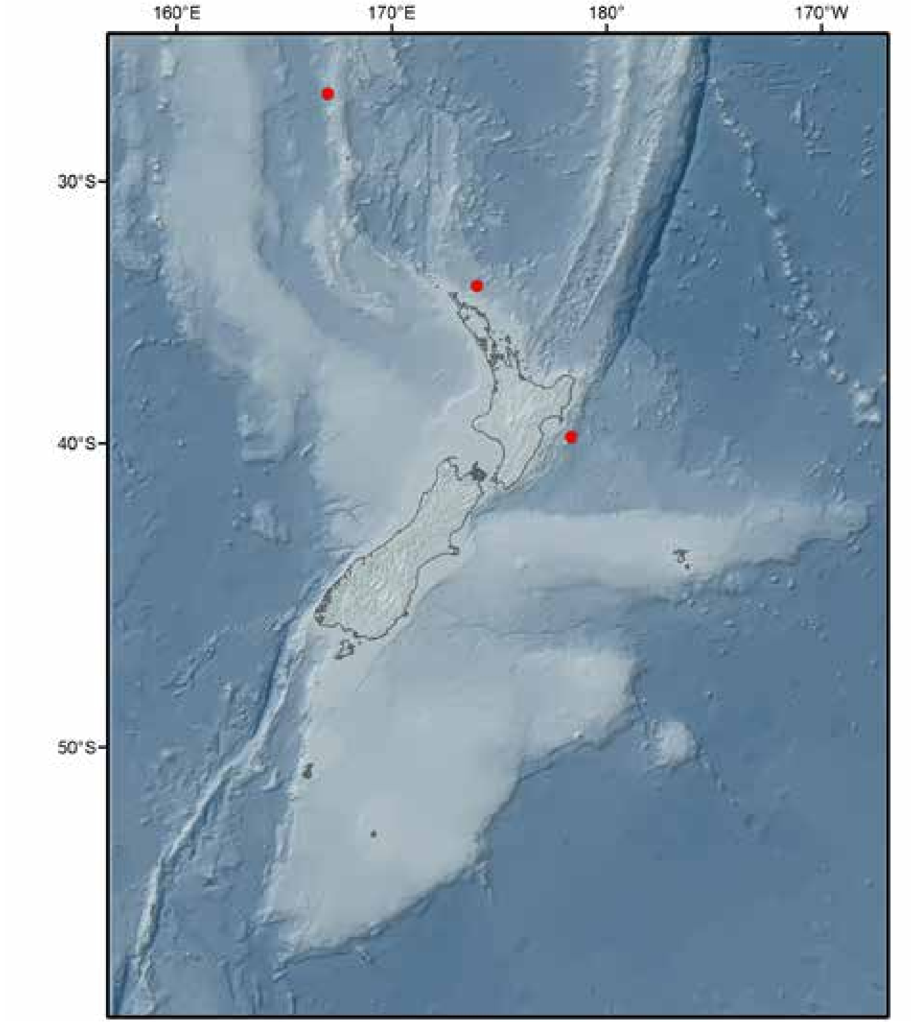


Figure 90. *Uroptychus ihu* **sp. nov.**, holotype female ov., NMNZ CR.022681: **A.** carapace and abdomen, dorsal; **B.** carapace and abdominal somites 1–2, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antennae, right and left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of right Mxp3; **H.** right cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, P2, lateral. Scale bars = 2 mm.

Figure 91. Distribution of *Uroptychus ihu* **sp. nov.** around New Zealand.



depth range (200–720 m compared to 805–1028 m for *U. ihu* **sp. nov.**). *Uroptychus cylindropus* is reported here from a seamount on the Colville Ridge, hence, both species occur in the New Zealand region. The overall shape of the carapace, the antenna, Mxp3, anterior sternite, and the unarmed pereopods clearly aligns these species. Differences between the two species include:

- the anterolateral corner of the carapace is unarmed in *U. cylindropus*, with a distinct spine in *U. ihu* **sp. nov.**;
- the sternal plastron lateral margins are sub-parallel in *U. cylindropus*, distinctly divergent posteriorly in *U. ihu* **sp. nov.**;
- antennal article 2 lacks a distinct lateral spine in *U. cylindropus*, with a small but distinct spine in *U. ihu* **sp. nov.**;
- the posterior margin of the telson is straight or slightly concave in *U. cylindropus*, distinctly emarginated in *U. ihu* **sp. nov.**;
- P3 merus is the shortest (length 0.8 × P4 merus) in *U. cylindropus*, the meri are successively shortening posteriorly with P3 1.1 × longer than P4 for *U. ihu* **sp. nov.**;
- the P4 propodus is distinctly longer compared to P2 and P3 in *U. cylindropus* (P4 is 1.2 × P2–3) while the propodi are subequal in length on P2–4 in *U. ihu* **sp. nov.**;
- the P2–4 dactyli have spines arranged perpendicularly along the flexor margin in *U. cylindropus* while the spines are inclined proximally in *U. ihu* **sp. nov.**;
- the rostrum is horizontal in lateral view in *U. cylindropus* while it is distinctly upturned dorsally in the holotype of *U. ihu* **sp. nov.**, but less distinctly so in the paratype NIWA 3613. The rostrum of the third specimen (NIWA 68804) is truncated, hence, this character needs to be considered with caution.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.8% (two specimens). Closest interspecific divergences: *U. tomentosus* (13.5–14.5%) and *U. cylindropus* (13.7–15.0%).

ZooBank registration. *Uroptychus ihu* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:9FF7D67A-629D-442C-993C-41FDAB0E0558.

Uroptychus inaequalis Baba, 2018 Figs 92, 93

Uroptychus pilosus, Ahyong & Poore, 2004a: 71, fig. 21; Schnabel 2009b: 30 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list). [Not *U. pilosus* Baba, 1981]
Uroptychus inaequalis Baba, 2018: 236, figs 107, 108.

Type & locality (not examined). Holotype—MNHN-IU-2011-5948, CALSUB PL07, 20°48′S, 167°05′E, Loyalty Islands, 970-489 m, 25 Feb 1989, female (pcl 5.1 mm).

Material examined. *West Norfolk Ridge*: NIWA 23136, NZOI Stn U566, 35°05.00′S, 169°09.70′E, 979 m, 2 Feb 1988, 1 male (8.5 mm, pcl 6.0 mm).

Distribution. New South Wales, Loyalty Islands, Solomon Islands, 966–1057 m; West Norfolk Ridge, 979 m (Fig. 93).

Habitat. Unfortunately, no specific note was retained with the specimen of *U. inaequalis* examined here but original station details indicate 'abundant biota', which included a chrysogorgiid, a large black coral (*Trissopathes* sp.) and three large hexactinellid glass sponges. There are no previous records of possible associations for *U. inaequalis*, but the two most similar species, *U. plautus* and *U. pilosus* are associated with primnoids and chrysogorgiids, respectivly.

Diagnosis. Body entirely covered with fine setae. Carapace anterolateral angle rounded; dorsum and lateral margins unarmed. Rostrum narrow (width < 0.5 × distance between anterolateral spines at its base). Pterygostomian flap with anterior sharp spine. Antennal article 2 with outer spine. Mxp3 merus with distolateral and flexor marginal spines. Pereopods 2–4 similar, setose; propodus flexor margin with pair of distal spines (mesial spine may be obsolete); dactyli longer than carpi, distally narrowed; with two distal spines only, ultimate more slender and shorter than penultimate.

Colour in life. Unknown.

Remarks. Ahyong & Poore (2004) reported a single specimen from New South Wales, Australia, as *Uroptychus pilosus* Baba, 1981 but noted small differences between this and the form originally described from Japan (reproduced in Fig. 92). Baba (2018) referred the Australian specimen to a new species, *U. inaequalis*, with additional records from the Loyalty Islands (New Caledonia) and the Solomon Islands, and described *U. plautus* from Indonesia. These three species uniquely share the presence of only two terminal spines on the P2–4 dactyli.

The specimen of *U. inaequalis* reported here has a cheliped length of 4.6 × the cl (6.1 × pcl, slightly longer than holotype) and P2–4 dactyli are slightly longer than holotype with ~1.5 × longer than the carpi. Slight differences to add to the variation of this species are the more concave (rather than straight) lateral margins of the rostrum (similar to *U. pilosus*), but the relative width and round apex is still closer in form to *U. inaequalis*. The antennal scale falls slightly short of the apex of article 4 (previously reported to either reaching or slightly overreaching the article). Both the right and the left antennal scales bear distinct lateral spines. The Mxp3 merus bears a small distinct distal spine but the spinules at the midlength of the flexor margin are obsolescent.

Uroptychus inaequalis is distinguished from both *U. pilosus* and *U. plautus* by the P2–4 dactyli that are distinctly longer than carpi (subequal in *U. pilosus* and shorter in *U. plautus*), the ultimate spine on the P2–4 dactyli is narrower than the penultimate (subequal in size in *U. pilosus*), the antennal article 2 bears a distinct lateral spine and the anterior pterygostomian flap bears distinct spines (acuminate and rounded, respectively, in *U. plautus*).

Uroptychus inermis Baba, 2018 Figs 94, 95

Uroptychus inermis Baba, 2018: 240, figs 109, 110.

Type & locality (not examined). Holotype—MNHN-IU-2014-16584, BIOCAL Stn DW36, 23°09′S, 167°11′E, Norfolk Ridge, 650–680 m, 29 Aug 1985, male (pcl 4.7 mm).

Material examined. *Northland Plateau*: NIWA 23374, NZOI Stn I64, 36°12.0′S, 176°11.80′E, 335 m, 12 May 1975, 1 female (6.5 mm, pcl 4.4 mm).

Distribution. Norfolk Ridge 650–680 m; Northland Plateau, 335 m (Fig. 95).

Habitat. Unknown.

Diagnosis. Carapace as broad as long (pcl); with dorsal surface smooth or feebly granulate; lateral margin unarmed other than strong anterolateral spine, overreaching small lateral orbital spine. Rostrum relatively wide, about 0.5 × distance between anterolateral spines; about half as long as remaining carapace. Pterygostomian flap smooth, anteriorly produced to spine. Antennal article 2 acuminate at distolateral angle, lacking distinct spine; articles 4 and 5 unarmed. Anterior margin of sternite 3 with median notch and submedian spines; sternite 4 anterolaterally rounded, falling short of submedian spines on sternite 3, surface smooth; sternite 5 anterolateral margin distinctly convex. Cheliped ischium with large distodorsal spine, with a few small granules ventrally, otherwise unarmed; meri and carpi unarmed; palm without sharply ridged mesial margin. P2–4 propodi with 2–4 spines along the flexor margin in addition to

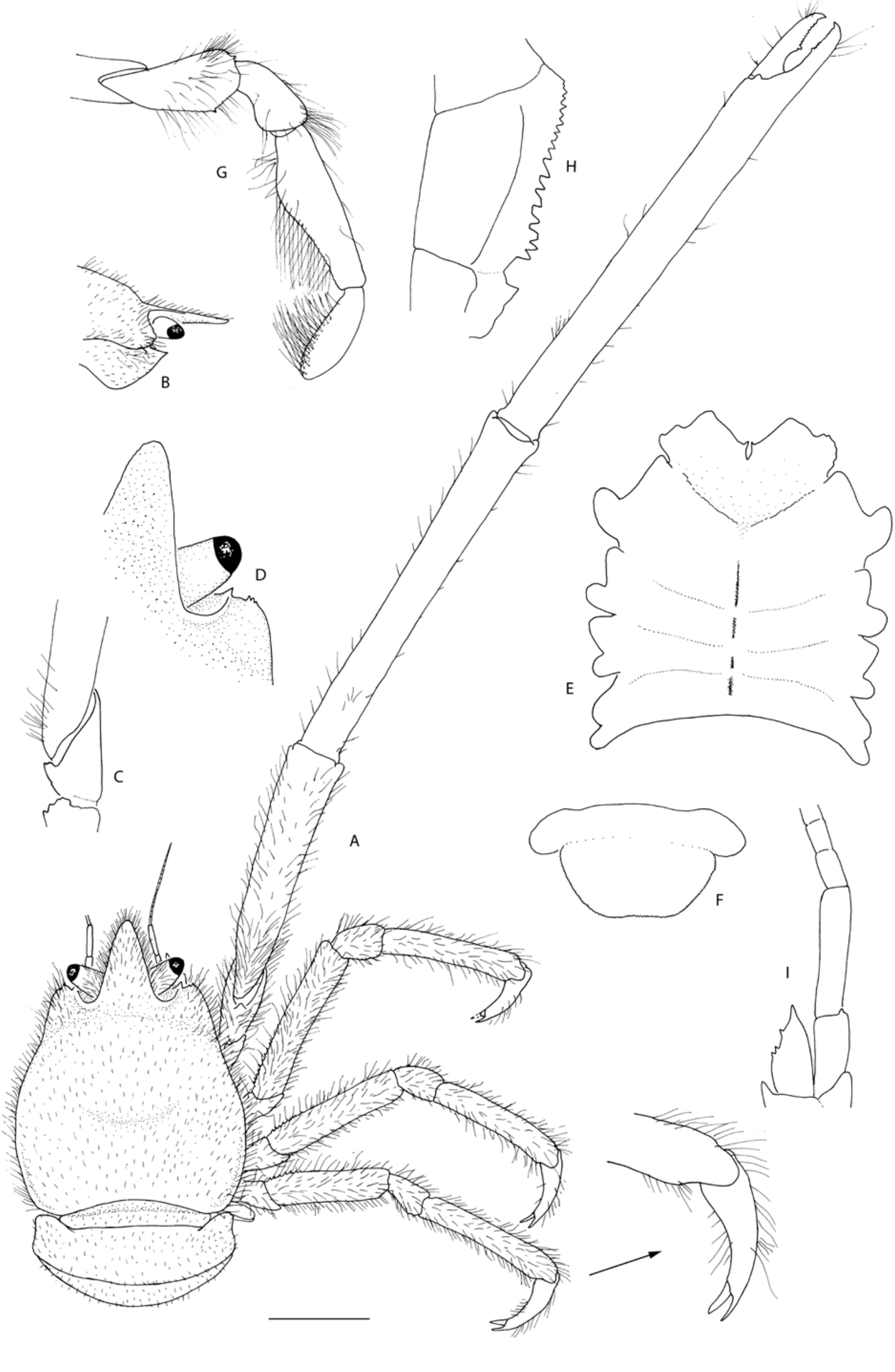


Figure 92. *Uroptychus inaequalis* Baba, 2018, male, off Ulladulla, AM P65626: **A.** dorsal habitus; **B.** anterior carapace, right lateral; **C.** cheliped, proximal right lateral; **D.** anterior carapace, right dorsal; **E.** sternal plastron; **F.** telson; **G.** endopod of Mxp3, right lateral; **H.** crista dentata of right Mxp3; **I.** antenna, right ventral. A–C = 3 mm, D–G = 1.5 m. H–I = 0.8 mm. After Ahyong & Poore (2004).

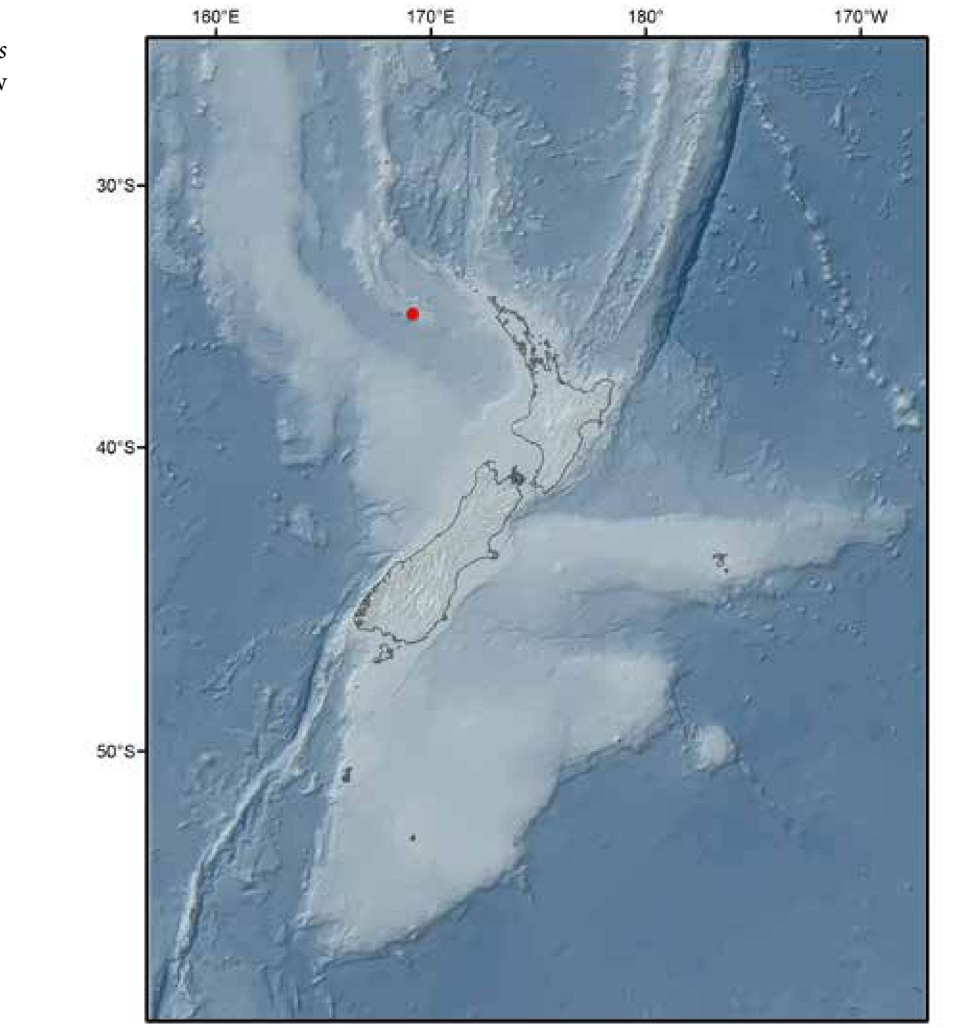


Figure 93. Distribution of *Uroptychus inaequalis* Baba, 2018 around New Zealand.

distal pair; dactyli about half as long as propodi, distally narrowed (not truncate), with 7 or 8 sharp triangular, slightly inclined spines along flexor margin; ultimate, penultimate and antepenultimate spines subequal in size.

Colour in life. Not known

Remarks. *Uroptychus inermis* is known from a single male specimen (pcl 4.7 mm) from the Norfolk Ridge just south of New Caledonia. The female NIWA 23374 was collected on the eastern Northland Plateau 13° further south and more than 300 m shallower than the holotype. The New Zealand specimen, however, matches the description in the diagnostic characteristics, namely the shape and ornamentation of the carapace, the antennal article 2 lacking a distinct distolateral spine, the ischium of cheliped unarmed ventrally, P2–4 propodi with only 2–4 spines along the flexor margin in addition to the distal pair.

The dorsal surface of the carapace and the merus and carpus of the cheliped appear slightly less granulate in the New Zealand specimen than the holotype and is more glabrous, the antennal scales are a little shorter (slightly overreaching the midlength of article 5 [Fig. 94E], compared to just falling short of the end of article 5 for the holotype), but otherwise it appears to exactly match the description.

Uroptychus inermis belongs to the '*litosus*/*bardi*' group of species (which now also includes *U. aotearoa* **sp. nov.**) with an unarmed carapace other than a strong anterolateral spine (which overreaches the small lateral orbital spine), thoracic sternite 3 with a median notch and submedian spines, the cheliped ischium ventrodistally without a distinct spine, P2–4 propodi with a row of spines and the dactyli with sharp triangular spines, the distalmost three subequal in size. This also includes *U. anacaena* Baba & Lin, 2008 from Taiwan. *Uroptychus inermis* can be distinguished from *U. litosus*, *U. bardi,* and *U. aotearoa* **sp. nov.** in that the P2–4 propodi have only two to four spines along the flexor margin, in addition to the distal pair, compared to seven or eight for *U. litosus*, 10–12 for *U. bardi,* and six to nine for *U. aotearoa* **sp. nov.** (at least on P2), and that the surface of sternite 4 is smooth in *U. inermis* (rather than with strong tubercles and granules in both *U. litosus* and *U. bardi*). *Uroptychus inermis* appears most like *U. anacaena* but the entire dorsal carapace surface and the pterygostomian flap are granulose in the latter, compared to mostly smooth (the anterior

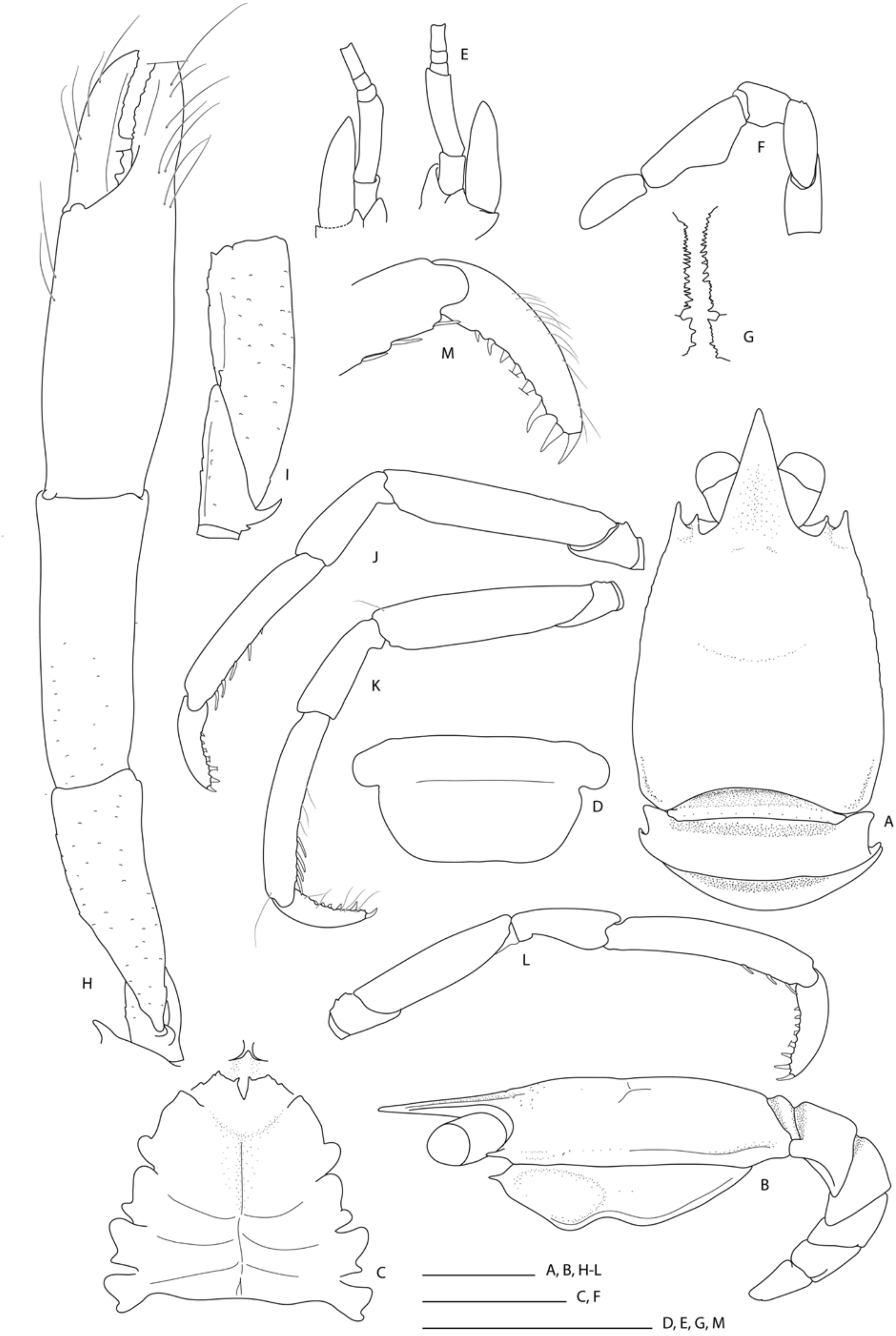
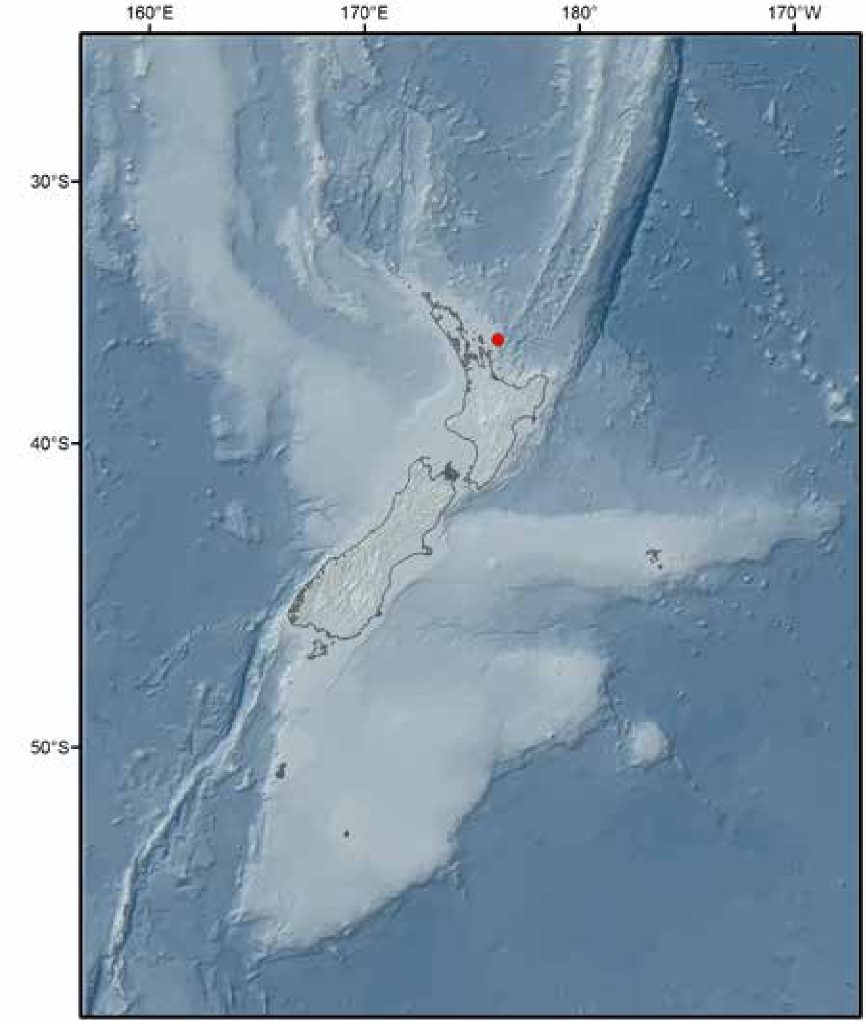


Figure 94. *Uroptychus inermis* Baba, 2018, female, NIWA 23374: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antennae, right and left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of left and right Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, P2, lateral; **N.** P2 distal propodus and dactylus. Scale bars = 2 mm.

Figure 95. Distribution of *Uroptychus inermis* Baba, 2018 around New Zealand.



portion of the carapace may be slightly granulose but the pterygostomian flap is entirely smooth). Additionally, antennal article 2 bears a distinct spine in *U. anacaena*, which is missing in *U. inermis*.

Uroptychus kaitara Schnabel, 2009 Figs 96, 97

Uroptychus kaitara Schnabel, 2009a: 553, figs 6, 7; Schnabel 2009b: 28 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list); Baba 2018: 24 (key).

Material examined. Holotype—NMNZ CR.012081, NZOI Stn K840, 30°17.59′S, 178°25.30′W, Macauley Island, Kermadec Islands, Kermadec Ridge, 398–412 m, 28 Jul 1974, 1 female ov. (3.5 mm, pcl 2.5 mm).

Type locality. Macauley Island, Kermadec Islands, 398–412 m.

Distribution. Known only from the type locality (Fig. 97).

Habitat. Unknown.

Diagnosis. Carapace entirely covered with small granules and spines on dorsal and lateral surfaces; dorsal surface sculptured with epigastric and cardiac regions inflated; lateral margins subparallel; anterolateral spine subequal in size to lateral orbital spine. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines at base). Anterior margin of abdominal tergite 2 with scattered small spines. Antennal articles 4 and 5 subequal in length, article 4 with long distal spine (rounded, lobe-like); antennal scale reaching midlength of article 5. Cheliped slender and unarmed except for small distodorsal spine on ischium. Pereopods 2–4 merus with 5–7 spines on dorsal crest; carpus unarmed; propodus with distal pair of spines only; dactyli not truncate distally, with 5 or 6 acute triangular spines along flexor margin, loosely arranged, perpendicular to flexor margin, ultimate spine very small (approximately quarter width of penultimate), penultimate largest, much larger than antepenultimate.

Colour in life. Unknown.

Remarks. The holotype of *U. kaitara* remains the only known specimen for this species to date. It was collected in 1974 during the Challenger Centenary Cruise which, incidentally, also uncovered the only specimens of *U. yaldwyni* Schnabel, 2009 and *U. webberi* Schnabel, 2009. The 2016 Kermadec-Rangitahua voyage (TAN1612) took samples in close proximity but, unfortunately, no further specimens of any of these rare species were collected.

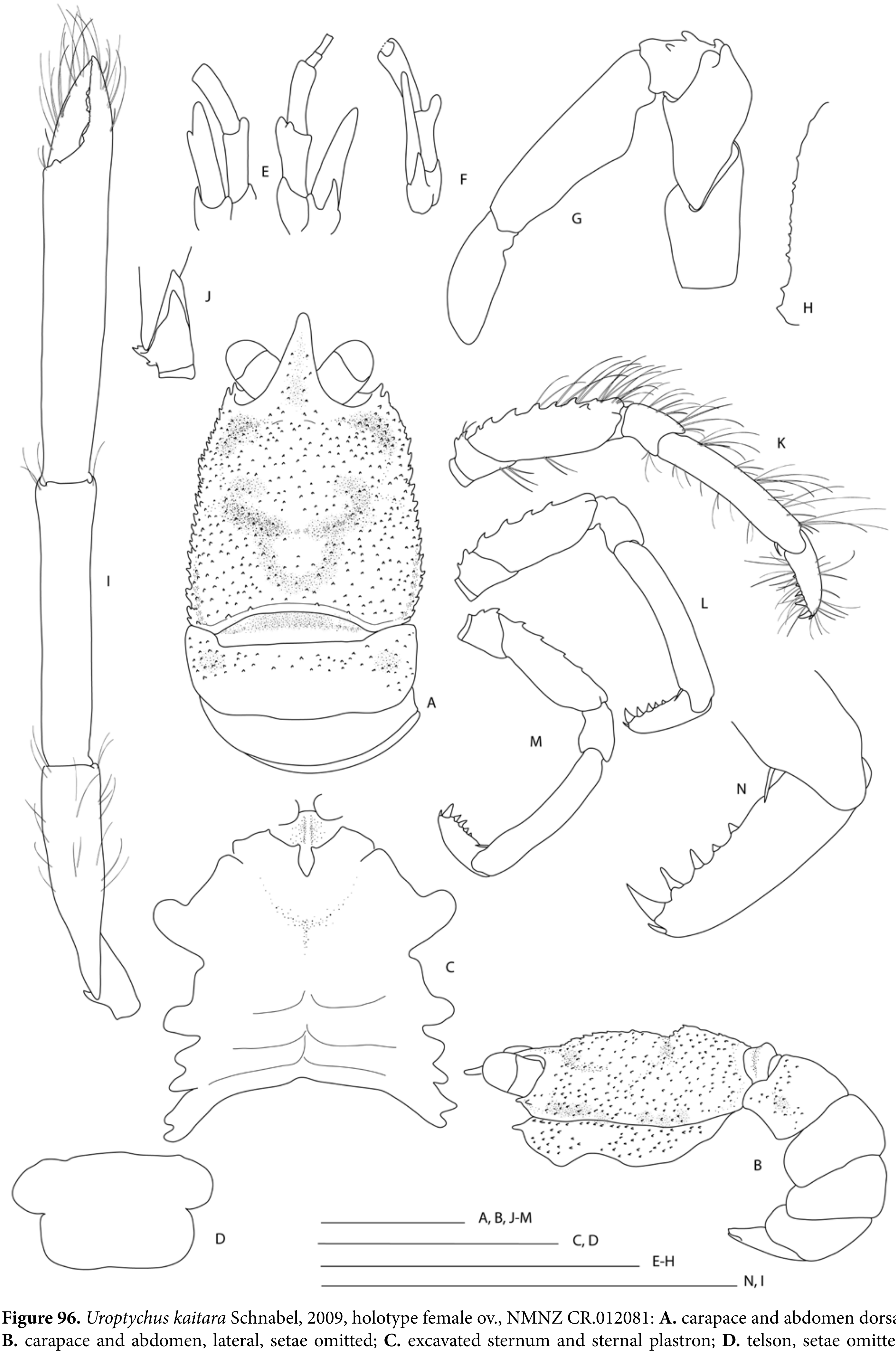
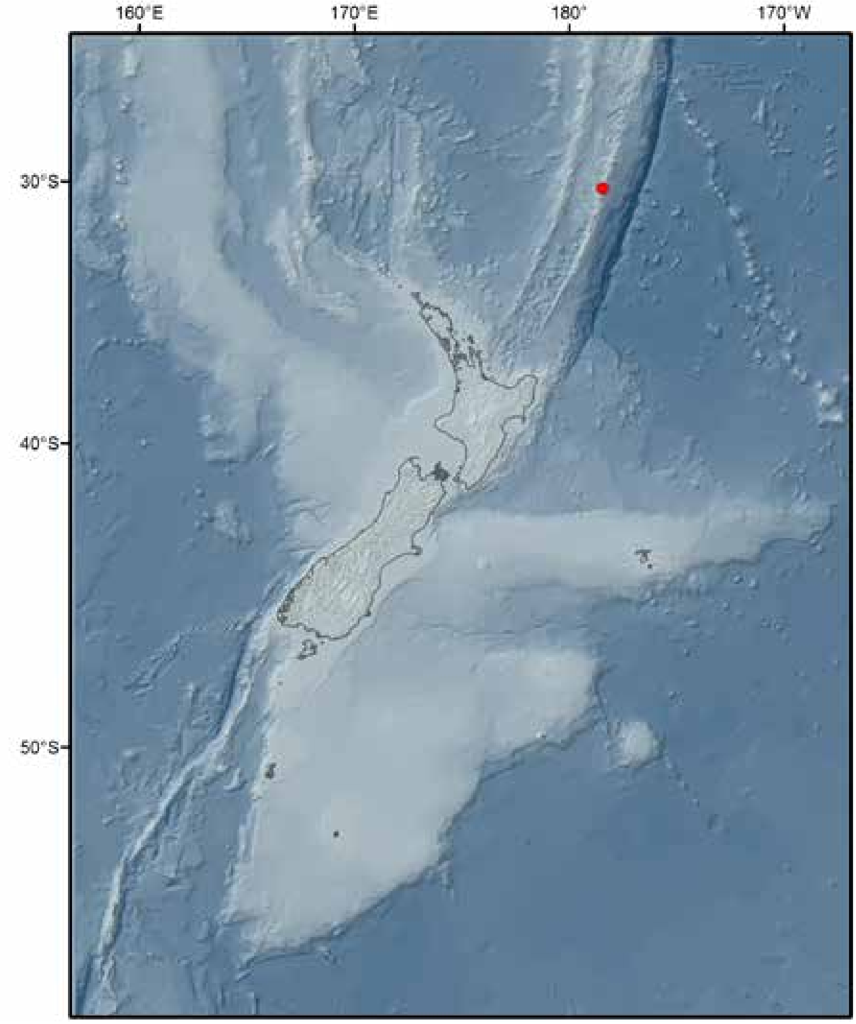


Figure 96. *Uroptychus kaitara* Schnabel, 2009, holotype female ov., NMNZ CR.012081: **A.** carapace and abdomen dorsal; **B.** carapace and abdomen, lateral, setae omitted; **C.** excavated sternum and sternal plastron; **D.** telson, setae omitted; **E.** antennae, left and right, ventral; **F.** antenna, right, lateral; **G.** endopod of Mxp3, left, lateral; **H.** crista dentata of left Mxp3; **I.** right cheliped, dorsal; **J.** left cheliped, proximal articles, mesial; **K–M.** right P2–4; **N.** dactylus and distal portion of propodus of right P2, lateral. Scale bars = 2 mm. Modified after Schnabel (2009).

Figure 97. Distribution of *Uroptychus kaitara* Schnabel, 2009 around New Zealand.



Illustrations of the excavated sternum and the mesial view of the cheliped ischiomerus of *U. kaitara* are provided to complement the original illustrations (Schnabel 2009: 554, fig. 6). The excavated sternum is anteriorly rounded and with a low but distinct ridge along the midline (Fig. 96C). The cheliped ischium is smooth along the ventral margin and the dorsal spine is bifurcated on both sides, with a small proximal spine also more visible than originally illustrated (Fig. 96J).

Uroptychus kaitara is unique among New Zealand species in the genus in that the carapace, pterygostomian flap and anterior portion of the abdomen are entirely covered with tubercles and spines. The only other known species that shares this morphology is *U. denticulifer* Baba, 2018 from a similar depth in Vanuatu. They also share features such as the minute ultimate and prominent penultimate spines on the P2–4 dactyli and the shape of thoracic sternite 4, with the posterolateral margin about as long as or longer than the anterolateral margin. Although probably closely related, they are clearly distinct in that in *U. denticulifer* the antennal scale is fused instead of articulated with the antennal article 2; the antennal article 5 is 1.6 × longer than instead of being subequal to article 4; and the P2–4 dactyli bear flexor marginal spines obliquely directed instead of perpendicular to the margin.

In New Zealand, a group of small species share the following characters (see remarks under *Uroptychus helenae* **sp. nov.**): the anterolateral spine is subequal in size to the lateral orbital spine; P2–4 propodi are unarmed except for a distal pair and the dactylar spines are regularly arranged, directed perpendicularly, the penultimate spine much broader than antepenultimate and the ultimate much smaller. Unlike *U. kaitara*, however, in all of these, the abdominal segments are smooth and unarmed and the walking leg meri are unarmed on the extensor margin, in addition to the dorsal carapace surface not being entirely covered with small spines.

Uroptychus koningen sp. nov. Figs 98, 99

Material examined. Holotype NMNZ CR.021658, MoNZ/MARS Stn 3K/012, 34°06.24′S, 171°55.94′E, Three Kings Islands, 673 m, 10 Mar 2010, Fish Trap, male (6.0 mm, pcl 3.7 mm). **Paratype** *Three Kings Islands*: NMNZ CR.021587, MoNZ/MARS Stn 3K/011, 34°07.33′S, 171°56.45′E, 544 m, 11 Mar 2010, Fish

Trap, 1 female (4.0 mm, pcl 2.5 mm; sequenced, see Fig. 5).

Type locality. Three Kings Islands, 673 m.

Distribution. Three Kings Islands, 544–673 m (Fig. 99).

Habitat. The female (NMNZ CR.021587) was preserved together with a single polyp of a bamboo coral, but unfortunately, no information remains on whether the specimen was picked off a coral colony or merely taken together at the same station.

Diagnosis. Carapace dorsal surface unarmed; lateral margin with anterolateral spine distinctly larger than and overreaching lateral orbital spine, bases of spines not contiguous; with one small hepatic spine and 4 or 5 small lateral branchial spines. Rostrum narrow (breadth < 0.5 × distance between anterolateral spines); lateral margins with pair of minute spines. Pterygostomian flap anteriorly narrowed, with pronounced anterior spine; surface with scattered few small spines on anterior and posterior portion. Sternite 3 with distinct median notch, submedian spines absent. Sternite 4 with posterolateral margin subequal to anterolateral margin. Antennal scale distinctly overreaching antennal peduncle; articles 4 with distinct distal spine; article 5 with minute spine. P2 merus with row of serrations on dorsal margin; carpus with small to obsolescent distal spine only; P2–4 propodi with 2–5 spines proximal to distally paired spines; dactyli distally narrowed (not truncate), with 13–17 obliquely directed, closely arranged spines, penultimate spine more than twice breadth of other spines, remainder slender, distal spines nearly contiguous to one another.

Description. Carapace: pcl 0.9 × width, shallow convex from side to side. Dorsal surface sparsely setose; cervical groove indistinct (faintly indicated); unarmed. Lateral orbital spine smaller than anterolateral spine. Anterolateral spine well-developed, overreaching lateral orbital spine, positioned remotely lateral to it (distance between about basal width of anterolateral spine). Lateral carapace margins nearly subparallel, slightly wider anteriorly; with six spines (or processes) excluding anterolateral spine: 1 hepatic, 1 anterior branchial, 4 or 5 posterior branchial spines; anterior branchial slightly larger than posterior branchial spines; posterolateral corner with small but distinct ridge. Rostrum narrow triangular (breadth < 0.5 × distance between anterolateral spines), horizontal, 0.6 × pcl; 1.2–1.3 × longer than wide at base; dorsal surface excavated; with fine lateral serration along distal portion. Pterygostomian flap with median row of spines in anterior portion and a few tubercles in posterior portion; anterior margin produced into sharp long spine.

Thoracic sternum: Excavated sternum with produced anterior margin and strongly ridged midline. Sternal plastron as wide as long, sternites 5–7 laterally subparallel; surface smooth. Sternite 3 anterolaterally acute; anterior margin shallow concave, median notch without submedian spines; lateral margins produced to spine. Sternite 4 2.1 × as wide as sternite 3, anteriorly shallow concave, midline grooved; anterolateral margin rounded, with small denticles; laterally unarmed; length of anterolateral margin subequal to posterolateral margin. Sternite 5 anterolateral margin unarmed.

Abdomen: Tergites sparsely setose, unarmed. Tergite 1 with no ridge dorsally, only slightly convex. Pleural margins of somites 2–4 rounded. Telson 1.7 × as broad as long; posterior margin slightly emarginated; posterior portion 0.8–0.9 × length of anterior portion.

Eyes: Smooth. Cornea subglobular, 0.4 × length of ocular peduncle.

Antennal peduncle: Article 2 with acute, short outer spine. Article 3 unarmed. Article 4 with large distal spine, mesial margin unarmed. Article 5 armed with small distomedian spine; mesially unarmed; 1.5 × as long as article 4. Antennal scale overreaching peduncle, overreaches first flagellar annulation; 4.6–4.7 × as long as wide.

Maxilliped 3: Coxa unarmed. Basis smooth along mesial ridge. Merus and ischium with surface smooth, ischium without distal spines; crista dentata with fine denticles. Merus extensor margin with distal spine; flexor margin with several acute tubercles. Carpus with proximal spine on extensor margin, otherwise unarmed.

Cheliped: Slender; [4.4]–4.5 × pcl; surface moderately setose. Ischium with long, sharp dorsal and ventral spines distally, a few additional spinules along ventromesial margin. Merus mesial surface with one row of denticles and one row of spines; ventral surface with one row of spines; distoventral spine strong. Carpus surface smooth; with two ventral spines and row of denticles; nearly as long as palm. Palm 2.4 × as long as wide, unarmed and sparsely covered with long setae. Dactylus 0.6 × as long as propodus length; occlusal margins denticulate, without gape.

Pereopods 2–4: Similar; surface setose. Merus dorsal margin with serrations or 4–6 low spines; ventral margin with distal spine on P2 and P3 only, P4 distally unarmed. P4 merus shortest, 0.8 × as long as P2 merus. Merus 1.0–0.7 × as long as propodus (P2–P4). Propodus 4.2–4.9 × longer than wide (shortest on P2, subequal P3–4), 1.5–1.6 × as long as dactylus; extensor margin smooth; flexor margin not inflated distally, with 2 or 3 spines proximal to distal pair. Dactylus

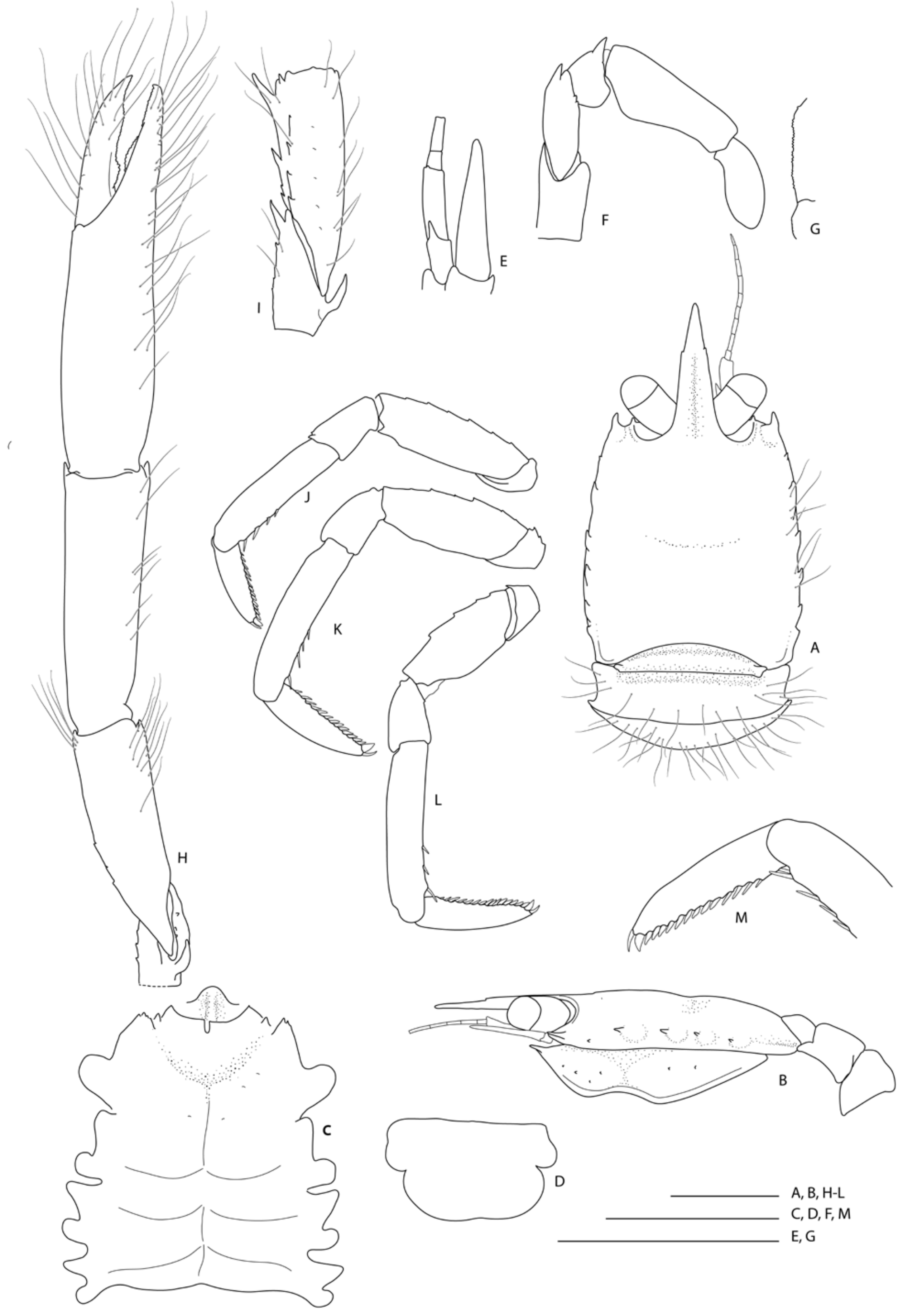
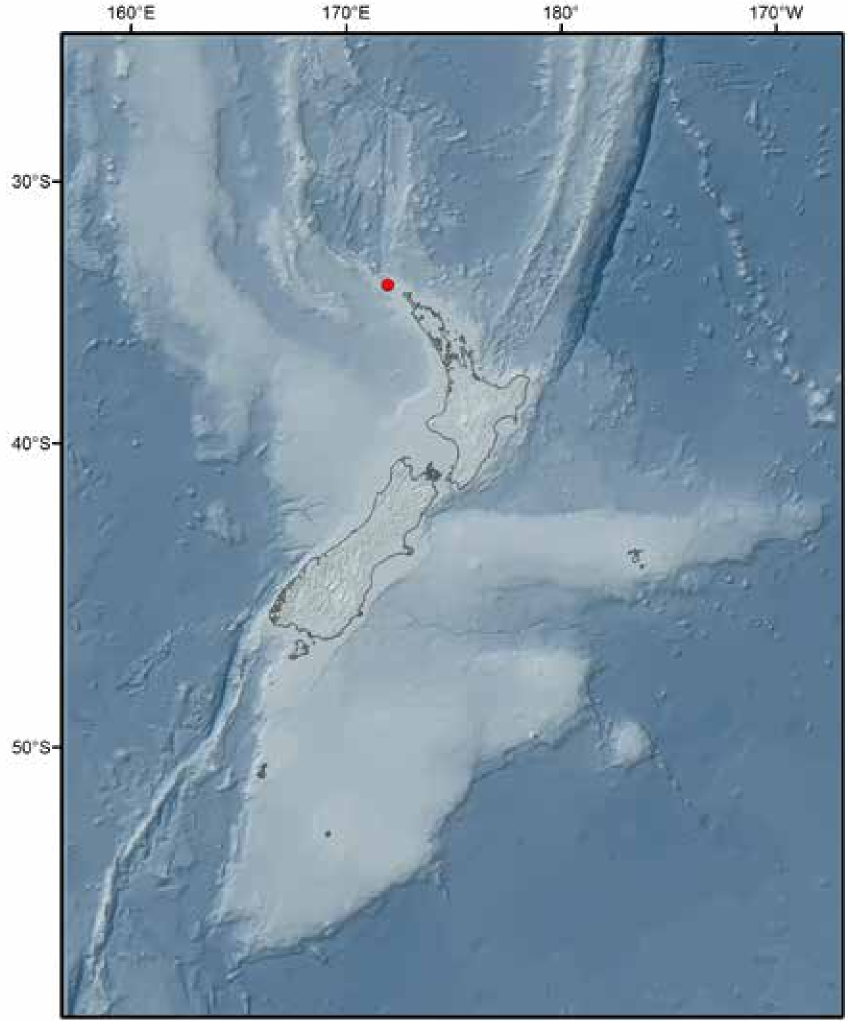


Figure 98. *Uroptychus koningen* **sp. nov.**, holotype male, NMNZ CR.021658: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** left antenna, ventral; **F.** endopod of right Mxp3, lateral; **G.** crista dentata of right Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** left P2–4; **M.** distal portion of propodus and dactylus, P3, lateral. Scale bars = 2 mm.

Figure 99. Distribution of *Uroptychus koningen* **sp. nov.** around New Zealand.



nearly straight; flexor margin with 15–17 movable spines along entire length, distal 8 or 9 stout rounded, proximal 4–6 slender and sharp; ultimate spine subequal in width to antepenultimate but sharper; penultimate spine prominent, about twice as broad as ultimate; spines closely spaced along flexor margin, distal spines somewhat broader, nearly contiguous to one another, proximal spines more loosely arranged.

Colour in life. Unknown.

Etymology. Named *koningen*, the Dutch term for 'kings', alluding to the only known location, the Three Kings Islands. The islands were originally named Drie Koningen Eyland by Dutch explorer Abel Janszoon Tasman on 6 January 1643, who, three weeks earlier had become the first European known to have seen New Zealand. Used as noun in apposition.

Remarks. *Uroptychus koningen* **sp. nov.** closely resembles *U. dissitus* Baba, 2018. The latter is based on a single male specimen (pcl 2.4 mm, MNHN-IU-2014-16395) collected from Vanuatu waters. *Uroptychus koningen* **sp. nov.** differs from *U. dissitus* in the following characteristics (Fig. 98):

- a small hepatic spine is present in *U. koningen* **sp. nov.**, absent in *U. dissitus*;
- the anterolateral spine in *U. koningen* **sp. nov.** overreaches the lateral orbital spine and the bases of the two spines are not contiguous, whereas *U. dissitus* has an anterolateral spine that reaches the tip of the lateral orbital spine and the two spines that are situated close to each other;
- the pterygostomian flap in *U. koningen* **sp. nov.** bears a large, sharp spine at its anterior point and a number of tubercles are scattered on the anterior and posterior portions, whereas the anterior point of *U. dissitus* bears only a small spine and the surface is smooth;
- the telson in *U. koningen* **sp. nov.** is differently proportioned and shaped, 0.5–0.6 × as long as broad and with the posterior margin emarginated, while *U. dissitus* has a telson that is 0.4 × as long as broad and with a convex posterior margin;
- the antennal scale in *U. koningen* **sp. nov.** distinctly overreaches the peduncle, overreaching the first annulation of the antennal flagellum, while in *U. dissitus* the antennal scale just overreaches the peduncle and does not reach the end of the first flagellar annulation;
- the distal spines of the antennal articles 4 and 5 in *U. koningen* **sp. nov.** have different sizes, with the article 4 bearing a long spine and article 5 a

small or obsolescent spine only. In *U. dissitus* both articles 4 and 5 bear distinct spines of similar size;

- the cheliped in *U. koningen* **sp. nov.** is stouter at 4.4–4.5 × the pcl compared to 5.5 × the pcl in *U. dissitus*. The cheliped palm is wider at 2.4 (male) or 2.5 (female) × longer than broad in *U. koningen* **sp. nov.**, compared to 2.7–2.8 in *U. dissitus*;
- the walking legs in *U. koningen* **sp. nov.** have the meri bearing serrations or small spines on the dorsal margins, while they are smooth in *U. dissitus*; the propodi bear no more than three spines along the flexor margin, in addition to the distal pair, while *U. dissitus* bears four or five spines on P2 and P3.

Uroptychus koningen **sp. nov.** is also aligned with *U. spinulus*, also from Vanuatu, in the overall size and shape of the carapace and the armature of the P2–4 dactyli. It can easily be identified by the number of spines on the P2–4 propodi flexor margins, 14–17 in *U. spinulus*, 2–5 in *U. koningen* **sp. nov.**, in addition to the distal pair. Also, the antennal scale overreaches the peduncle in *U. koningen* **sp. nov.**, while it falls short of the end of the peduncle in *U. spinulus*.

In New Zealand, *U. koningen* **sp. nov.** appears most closely related to *U. taranui* **sp. nov.** in having five lateral branchial spines on carapace, sternal plastron with sub-parallel lateral margins, P2–4 propodi with spines along flexor margin, dactyli with nearly contiguous row of spines. However, *U. koningen* can be distinguished from *U. taranui* by the rostral lateral margin that bears distinct subterminal spines versus distal serrations; the carapace dorsal surface that is smooth versus bearing scattered small spines; the P2–4 meri that are smooth versus bearing spines on the ventral margin; carpal extensor margin that is smooth versus spinose; and the proposal extensor margin is smooth versus bearing spines.

Genetically, *U. koningen* **sp. nov.** closely resembles *U. tracey* Ahyong, Schnabel & Baba, 2015, see below. Both these species have a similar antennal and sternal morphology and the dactyli of the walking legs are similarly shaped and armed. *Uroptychus tracey*, however, is generally much more spinose and easily distinguished from *U. koningen* **sp. nov.**

In the key to species, *U. koningen* **sp. nov.** is paired with *U. taranaki* **sp. nov.**; differences are discussed under the account of that species below.

DNA sequence data. Closest interpecific sequence divergences for partial CO1 gene: 10.8–11% (*U. tracey*, two specimens).

ZooBank registration. *Uroptychus koningen* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:2D446529-E52A-4E5D-8F08-C5796EC3A499.

Uroptychus laperousazi Ahyong & Poore, 2004

Figs 100, 101

Uroptychus laperousazi Ahyong & Poore, 2004: 47, fig. 12; Baba 2005: 227 (synonymies, key); Baba *et al.* 2008: 35 (list and synonymies); Baba 2018: 33 (key).

Type & locality (not examined). SAM C6084, S of Eucla, 33°45´S, 129°17´E, Great Australian Bight, 999–1110 m, female ov. (cl 8.4 mm).

Material examined. *Bay of Plenty*, *Nukuhou Knoll*: NIWA 9006, NIWA Stn TAN0413/63, 37°13.45–13.17′S, 177°14.05–14.26′E, 693–698 m, 11 Nov 2004, 1 female ov. (5.5 mm, pcl 4.0 mm).

Distribution. Great Australian Bight, 984–1110 m; Nukuhou Knoll, Bay of Plenty, 693–698 m (Fig. 101).

Habitat. The type description of *U. laperousazi* indicates that a paratype was collected with a black coral. While no records remain with the New Zealand specimen, a black coral of the genus *Dendropathes* was collected at the same station.

Diagnosis. Carapace dorsally smooth, unarmed; lateral margins distinctly convex, slightly crenulate, unarmed except for small anterolateral spine. Lateral orbital angle produced to small spine reaching or slightly extending anteriorly beyond anterolateral spine. Rostrum narrow triangular (basal width < 0.5 × distance between anterolateral spines). Eyes short (1.3 × longer than broad). Sternite 3 with V-shaped anterior margin, median notch absent or faintly indicated. Antennal article 2 unarmed laterally; antennal peduncle with articles 4 and 5 each armed with small distal spine; antennal scale barely reaching end of peduncle. Pereopods 2–4 propodi with straight flexor margin (not inflated), bearing 8 or 9 spines, distalmost paired; dactyli distally narrowed, with 6–9 sharp triangular, obliquely directed spines along flexor margins; ultimate largest; proximal 3 subequal in size.

Colour in life. Unknown.

Remarks. One small ovigerous female of *U. laperousazi* matches the type series in most aspects, but differs in that the lateral orbital spine slightly extends beyond the anterolateral spine (instead of falling short); the cheliped merus has a few scattered granules on the proximomesial portion (the type description reports them as absent); the P2–4 propodi have six to eight movable spines along the flexor margin (eight or nine spines for the larger female holotype); and the dacyli have 9–11 spines along the flexor margin (eight or nine spines in the holotype). Further material, or DNA sequencing, may be needed to verify whether the New Zealand specimen is indeed the same species or a close ally.

The excavated sternum of *U. laperousazi* was not mentioned in the type description and this character

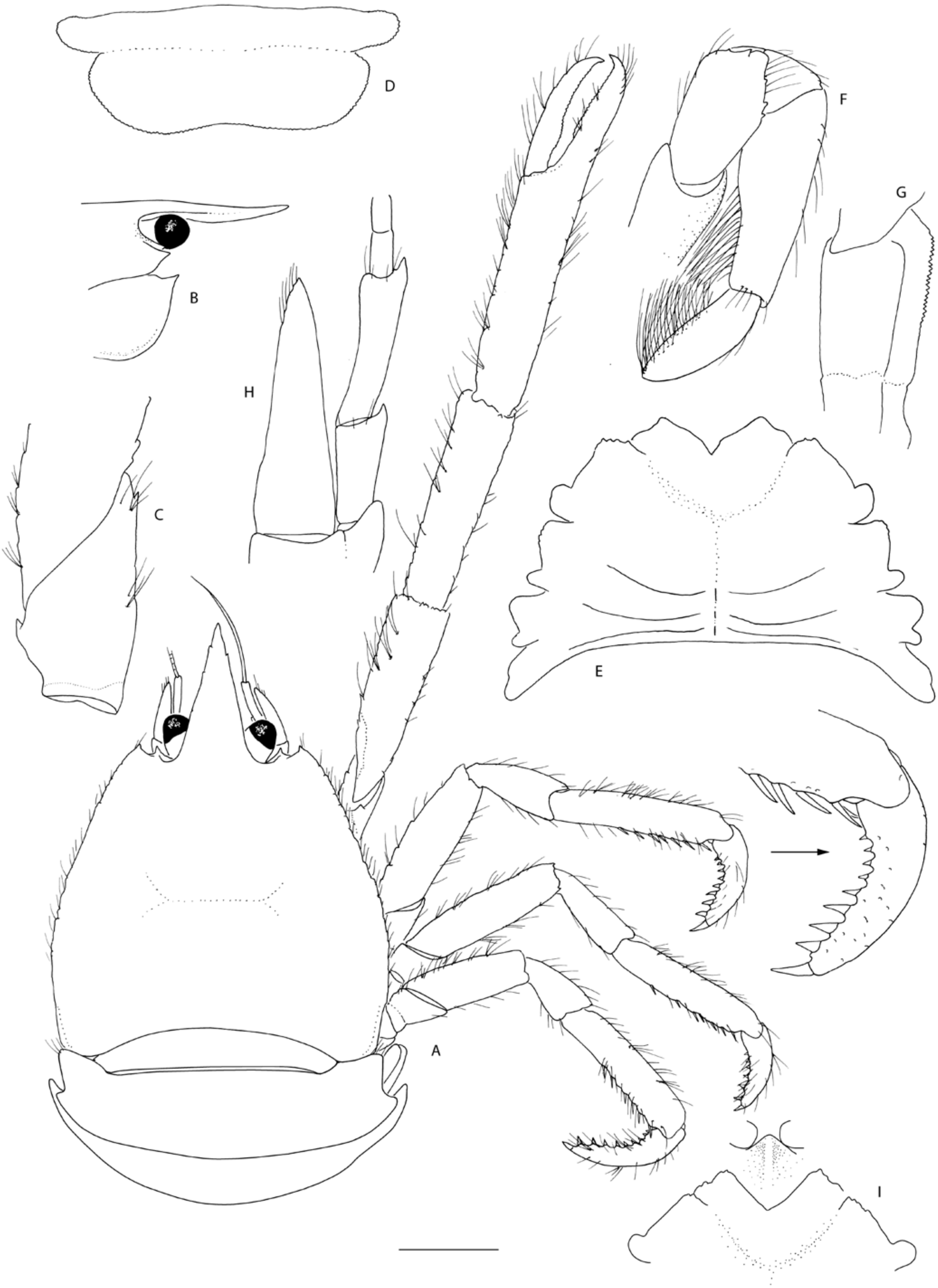
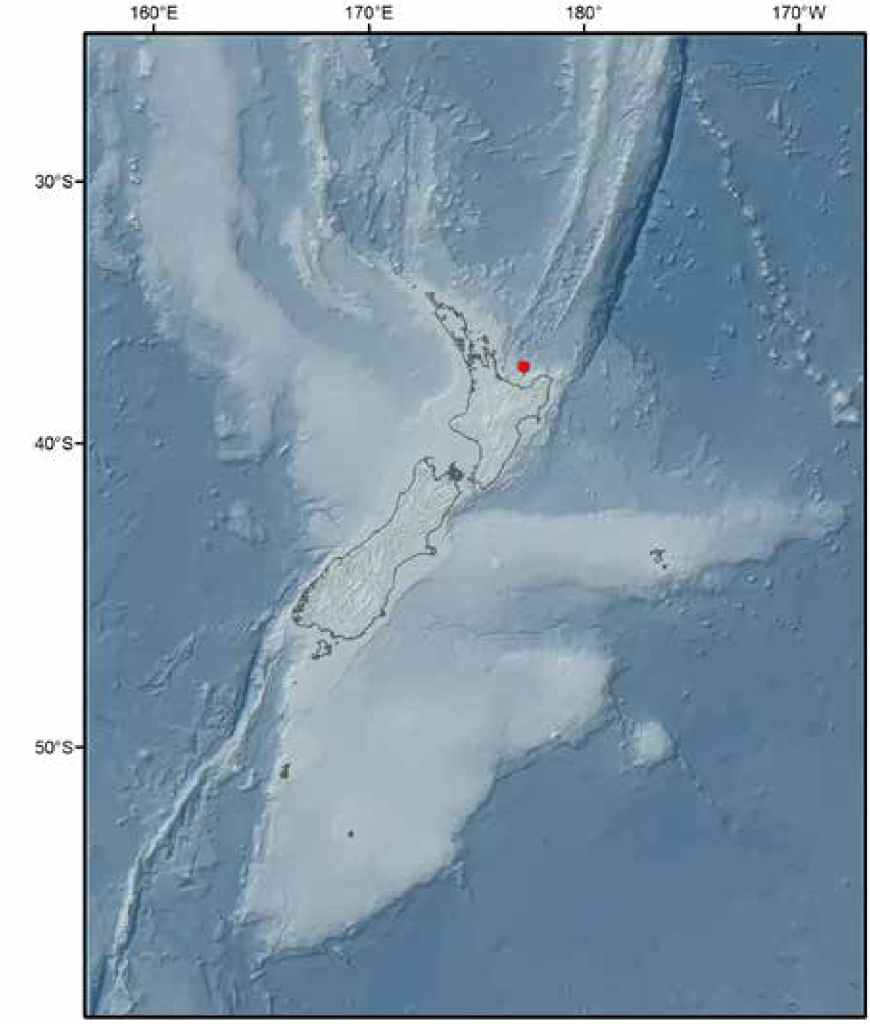


Figure 100. *Uroptychus laperousazi* Ahyong & Poore, 2004, A–H, holotype female, SAM C6084; I, female ov., NIWA 9006: **A.** dorsal habitus; **B.** anterior carapace, right lateral; **C.** cheliped ischium, proximal right lateral; **D.** telson; **E.** sternum; **F.** Mxp3, right lateral; **G.** crista dentata, right; **H.** antenna, right ventral; **I.** excavated sternum and anterior margin of sternal plastron. Scale A–B = 2 mm, C–F, I = 1 mm, G–H = 0.5 mm. After Ahyong & Poore (2004).

Figure 101. Distribution of *Uroptychus laperousazi* Ahyong & Poore, 2004 around New Zealand.



has since been used more commonly. The original figure of the female holotype (SAM C6084) is reproduced here and augmented by the illustration of the excavated sternum for the New Zealand specimen (Fig. 100I). The excavated sternum is anteriorly conical with a low ridge along the midline.

Uroptychus laperousazi most closely resembles *U. latus* Ahyong & Poore, 2004, with the only diagnostic difference being the presence or absence of the lateral spine on antennal article 2 (present in *U. latus* and absent in *U. laperousazi*). *Uroptychus latus* is so far not known from New Zealand, but a specimen from the Tasmanian seamounts is deposited as NIWA 23151 and was used for comparison.

In New Zealand, *U. laperousazi* most closely resembles *U. torrancei* **sp. nov.** and *U. plumella* Baba, 2018 but it differs from both in having the antennal scale barely reaching the apex of the antennal peduncle (the scale clearly overreaches the peduncle in both the other species), and the antennal article 2 being distolaterally unarmed (*U. torrancei* **sp. nov.** has a strong spine and *U. plumella* a small lateral spine), the P2–4 propodi are not distally inflated (inflated in *U. plumella*) and the Mxp3 merus is distally furnished with a small spine or granules on the extensor margin (*U. torrancei* **sp. nov.** bears a strong spine).

***Uroptychus leptus* sp. nov.** Figs 102, 103

Uroptychus longicheles, Schnabel 2009b: 28 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list).

Material examined. Holotype NMNZ CR.025234, NORFANZ Stn TAN0308/57, 29°13.07′S, 159°0.43′E, north of Middleton Reef, Lord Howe Rise, Australian EEZ, 300 m, 21 May 2003, female ov. (3.1 mm, pcl 2.2 mm).

Type locality. Lord Howe Rise, north of Middleton Reef, 300 m.

Distribution. Known only from the type locality (Fig. 103).

Habitat. Unknown.

Diagnosis. Carapace dorsally smooth, lateral margins with 3 spines other than anterolateral spine. Anterolateral spine distinctly larger than lateral orbital spine. Rostrum sharp triangular, about half distance between anterolateral spines at its base. Pterygostomian flap anteriorly round. Thoracic sternite 3 anterolaterally acute; anterior margin concave with median notch flanked with submedian spines; sternite 4 anterolateral margin as long as posterolateral margin. Antennal scale over-reaching peduncle; articles 4 and 5 each with slender spine, distal spine of article 5 very long, 0.7–0.8 × as long as article itself. P2 carpus with small distal and proximal spines, P3–4 carpi unarmed; propodi very slender, 7–8 × longer than wide, flexor margin nearly straight, with distal pair of spines only; dactyli distally tapering, with 10 slender, loosely arranged spines along distal three-fourth of flexor margin; penultimate spine prominent; ultimate spine approximately half as wide as penultimate, approximately 2 × as wide as antepenultimate.

Description. Carapace: pcl 0.9 × width, shallow convex from side to side. Dorsal surface smooth, unarmed; cervical groove indistinct (faintly indicated). Lateral orbital spine small. Anterolateral spine well-developed, much larger than and overreaching tip of lateral orbital spine; lateral carapace margins subparallel, slightly wider posteriorly, with 3 spines excluding anterolateral spine: 1 anterior branchial, 2 posterior branchial spines; subequal in size. Rostrum narrow triangular (breadth < 0.5 × distance between anterolateral spines), acute, slightly upturned, 0.5 × pcl; dorsal surface concave, smooth; lateral margins slightly irregular but straight; one pair of small sub-apical spines on either side. Pterygostomian flap smooth; anterior margin rounded, unarmed.

Sternum: Excavated sternum anteriorly rounded, with distinctly ridged midline. Sternal plastron 1.3 × as wide as long, widening posteriorly; surface smooth. Sternite 3 anterolaterally acute, with pair of small spines; anterior margin with median notch flanked by submedian spines; lateral margins square; surface smooth. Sternite 4 2.0 × as wide as sternite 3, anteriorly shallow concave, midline indistinctly grooved; anterolateral margin produced to acute, slender tooth, not overreaching sternite 3; as long as posterolateral margin; laterally unarmed. Sternite 5 anterolateral margin with small spine on rounded margin.

Abdomen: Tergites smooth and unarmed. Tergite 1 with transverse ridge. Pleural margins of somites 2–4 rounded. Telson nearly 2 × as broad as long; posterior margin slightly emarginated; posterior portion 0.8 × length of anterior portion.

Eyes: Smooth. Cornea subglobular, 0.5 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine. Article 3 unarmed. Article 4 with large distal spine, about half size of spine on article 5; mesial margin unarmed. Article 5 armed with large distomedian spine, about 0.8 × length of article; mesial margin unarmed; 2 × as long as article 4. Antennal scale overreaching peduncle (but not distal spine on article 5); 5.8 × as long as wide.

Maxilliped 3: Coxa with small lateral spine and obsolescent mesial spine. Basis with 1 or 2 denticles along mesial ridge. Merus and ischium with surface smooth, ischium without distal spines; crista dentata with 20 or 21 denticles. Merus extensor margin with long and slender distal spine; flexor margin with median spine. Carpus with proximal spine on extensor margin, otherwise unarmed.

Cheliped: Missing.

Pereopods 2–4: Similar; surface smooth. Merus dorsal margin with small proximal and distal spine on P2, no spines on P3–4; ventral margin with small distal spine on P2, acuminate on P3–4. Shortest merus on P4, 0.8 × length of P2 merus; merus 0.9–× 0.7 as long as propodus (from P2 to P4), 7–8 × longer than wide. Carpus dorsal margin with distal spine on P2 only, in addition to one proximal spine; unarmed and rounded on P3–4. Propodus 7–8 × longer than wide; extensor margin smooth; flexor margin not inflated distally, with distal pair of spines only; 2 × as long as dactylus. Dactylus nearly straight; flexor margin with 10 slender movable spines along the distal ¾; ultimate spine half as wide as penultimate spine, distinctly larger than antepenultimate; spines regularly and loosely arranged along flexor margin; ultimate and penultimate adjacent.

Ovum. Holotype with 2 large eggs, each 1.1 mm in diameter (Fig. 102A).

Colour in life. Pale, transparent, anterior portion of carapace and ocular peduncle darker reddish. Eggs dark orange.

Etymology. Named *leptus*, transliterated from the Greek term 'leptós' for 'slender', alluding to the elongate and slender appearance of the walking legs in this species.

Remarks. A single specimen of *Uroptychus leptus* **sp. nov.**, unfortunately, is missing the chelipeds but is sufficiently distinct to recognise it as a new species. The small (pcl 2.2 mm) ovigerous female is dorsally smooth with three pairs of lateral spines along the lateral branchial margins of the carapace but most notable are the very slender walking legs, which are nearly entirely unarmed and the antennal peduncle with unusually long distal spines on article 5 (Fig. 102E).

In the key to New Zealand species, *U. leptus* **sp. nov.** is paired with *U. bathamae* **sp. nov.** and *U. belos* Ahyong & Poore, 2004, with which it shares the general characteristics of P2–4 dactyli being subequal in length (as opposed to posteriorly lengthening dactyli, as in *U. tasmani* **sp. nov.**). Differences are discussed under the species above.

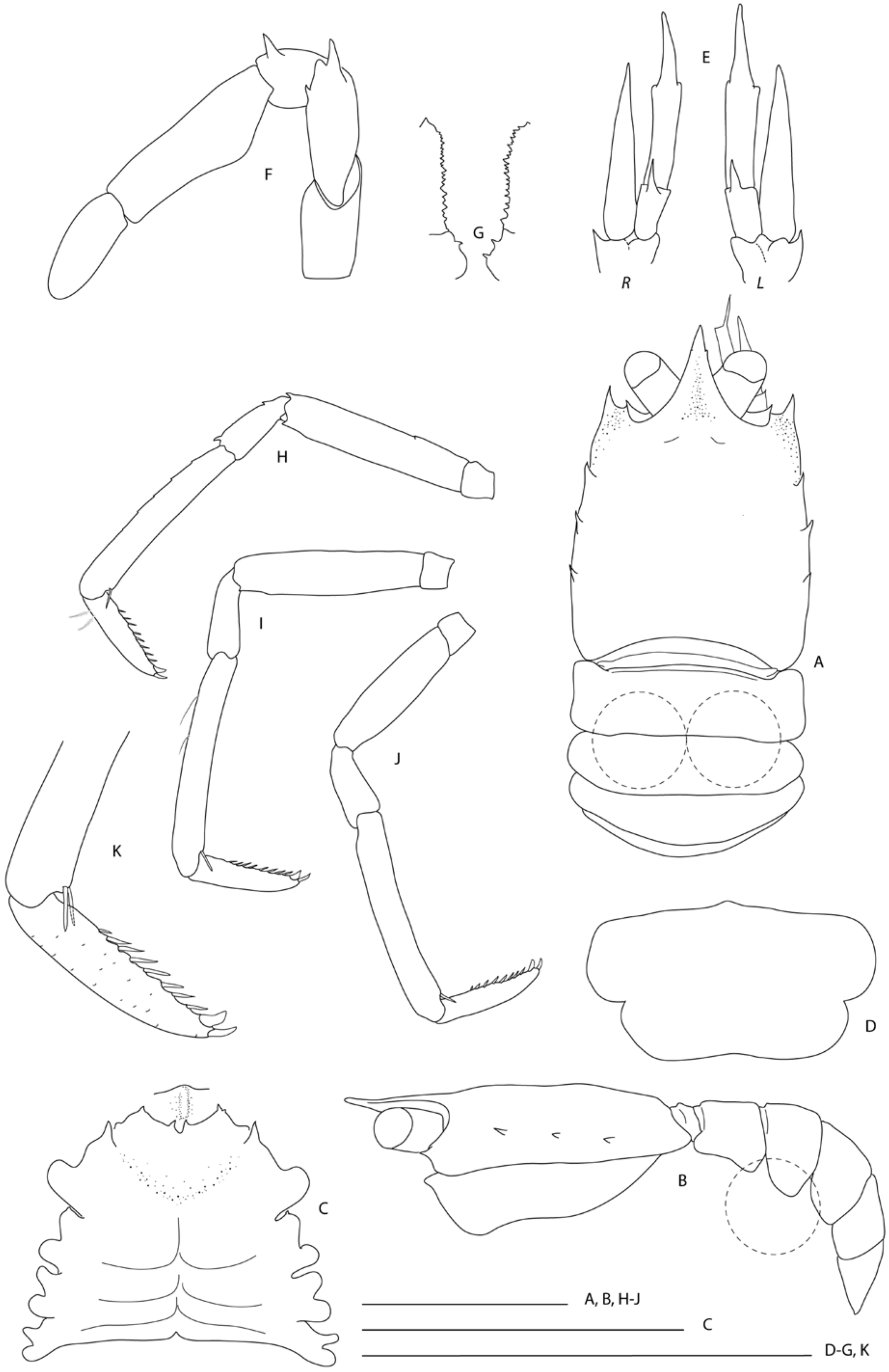
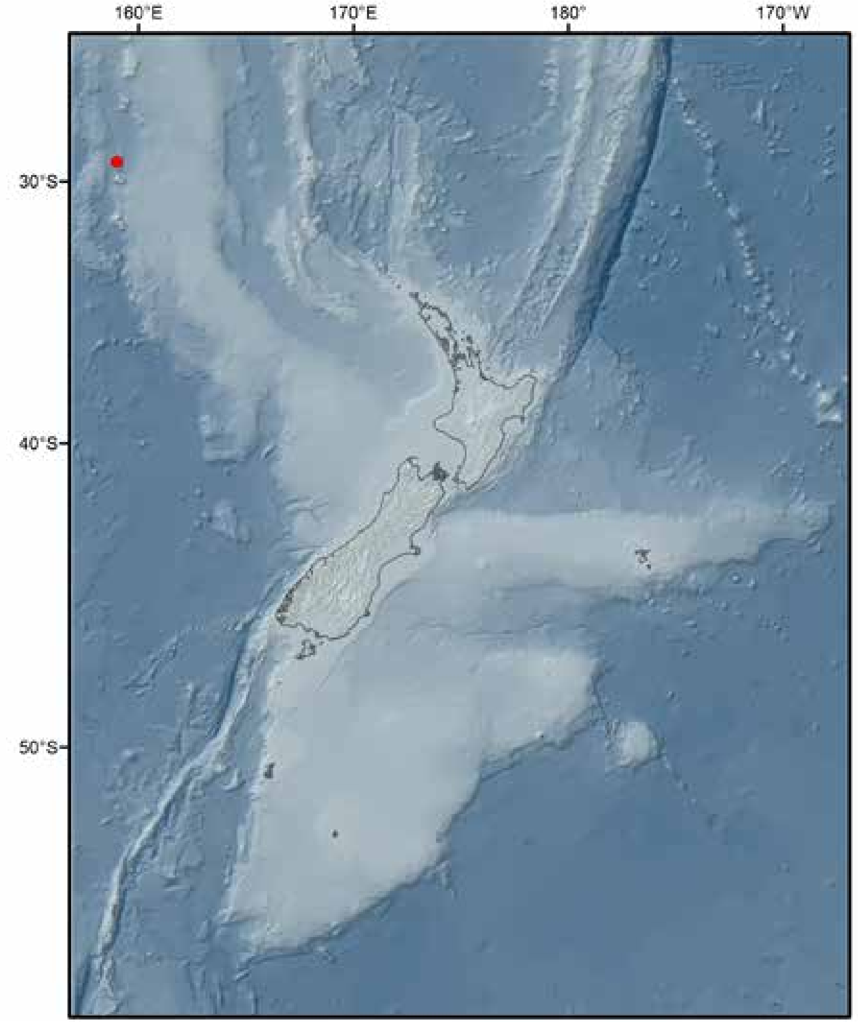


Figure 102. *Uroptychus leptus* **sp. nov.**, holotype female ov., NMNZ CR.025234: **A.** carapace, abdomen and incubated eggs under abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antennae, right and left, ventral; **F.** endopod of left Mxp3, lateral; **G.** crista dentata of left and right Mxp3; **H–J.** right P2–4; **K.** distal portion of propodus and dactylus, P2, lateral. Scale bars = 2 mm.

Figure 103. Distribution of *Uroptychus leptus* **sp. nov.** around New Zealand.



Uroptychus leptus **sp. nov.** most closely resembles *U. longicheles* Ahyong & Poore, 2004 with respect to the shape of the carapace, sternal plastron, the dorsally excavated rostrum, and the spination of the P2–4 dactylar spines, and was previously listed as *U. longicheles* from New Zealand by Schnabel (2009b), Webber *et al.* (2010) and Yaldwyn & Webber (2011). *Uroptychus leptus* **sp. nov.**, however, has a sharp triangular rostrum (apex rounded in *U. longicheles*), a distinctly larger anterolateral carapace spine compared to the lateral orbital spine (subequal in size in *U. longicheles*), three spines on lateral carapace margin (four or five spines in *U. longicheles*), and comparably more slender P2 meri and propodi (7–8 × longer than wide for both in *U. leptus* **sp. nov.** compared to four or five in *U. longicheles*). The antennal characteristics are also different with respect to size of antennal scale (clearly overreaching the peduncle in *U. leptus* **sp. nov.** and not reaching midlength of article 5 in *U. longicheles*), article 5 about twice as long as article 4 in *U. leptus* **sp. nov.** (subequal in *U. longicheles*) and article 5 with strong spine (unarmed in *U. longicheles*).

With respect to the carapace shape, the proportions of the antennal articles and the armature of the Mxp3 and sternum, *U. leptus* **sp. nov.** resembles *U. angustus* Baba, 2018 from Tonga. *Uroptychus angustus* has a number of spines on the dorsal carapace surface, which are absent in *U. leptus* **sp. nov.**, the antennal scale not overreaching the peduncle (overreaching in *U. leptus* **sp. nov.**), and the walking legs are stouter and more spinose (nearly entirely unarmed and more slender in *U. leptus* **sp. nov.**).

ZooBank registration. *Uroptychus leptus* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:BC22211B-95E4-43B6-A8E1-176108F8164B.

Uroptychus litosus Ahyong & Poore, 2004

Figs 104, 105; Seafloor Image 7

Uroptychus litosus Ahyong & Poore, 2004a: 52, fig. 14; Poore, 2004: 226, figs 60f, 62g (compilation); Baba 2005: 227 (synonymies, key); Baba *et al.* 2008: 36 (list and synonymies); Baba, 2018: 270, fig. 125.

Type & locality (not examined). Holotype—NMV J52862, Stn SS01/97/56, Andy's Seamount, 65.5 km SSE of SE Cape, Tasmania, 44°10.8′S, 147°00.0′E, 800 m, male (cl 17.8 mm).

Material examined. *Kermadec Ridge*: NIWA 127112, Stn SO254/33ROV08, 35°22.94′S, 178°58.76′E, 1216.8 m, 07 Feb 2017, 1 female ov. (14.8 mm, pcl

10.2 mm), 1 male (18.9 mm, pcl 13.4 mm), picked off a *Chrysogorgia* sp.; NIWA 86303, NIRVANA Stn TAN1213/39, western flank of Havre Volcano, 31°06.25–06.11′S, 179°05.97–05.97′W, 1022–1034 m, 20 Oct 2012, 2 females (13.4, 11.6 mm, pcl 9.3, 7.9 mm; smaller female sequenced, see Fig. 5).

Northland Plateau, *Mercury Knoll*: NIWA 23385, Stn Z9149/SMT9801/03, 36°32.23′S, 176°30.98′E, 906–951 m, 16 Jun 1998, 1 male (19.1 mm, pcl 13.5 mm).

Bay of Plenty, *Matatara Knoll*: NIWA 83318, NIWA Stn TAN1206/164, 37°10.83–10.84′S, 176°58.86–58.79′E, 1000–998 m, 30 Apr 2012, 1 female ov. (15.3 mm, pcl 11.0 mm).

Other material. NIWA 123246, CSIRO Stn SS01/97/56 (type locality), 44°10.80–12.00′S, 147°00–146°57.60′E, Andy's Seamount, south of Tasmania, 800 m, 29 Jan 1997, 1 female (7.2 mm, pcl 4.9 mm), picked off a *Chrysogorgia* sp.

Distribution. Southern Tasmania, Wallis and Futuna Islands, and Solomon Islands; 728–1120 m; Reinga Ridge, Bay of Plenty, Kermadec Ridge, 906–1217 m (Fig. 105).

Habitat. Typically collected on seamounts. Two samples were picked off the same morphotype of gold coral (*Chrysogorgia*), of which NIWA 127112 was collected using the ROV *KIEL* 6000 (Seafloor Image 7). Ahyong & Poore (2004) report two specimens on a 'gold bamboo coral with base 8–10 inches in diameter'.

Diagnosis. Carapace about as long as broad (without rostrum); dorsal surface unarmed except for a few scattered epigastric denticles; lateral margin with well-developed anterolateral spine, overreaching small lateral orbital spine, otherwise unarmed (may be irregular or bearing a few denticles); posterolaterally with distinct ridge. Rostrum narrow triangular (breadth at base < 0.5 × distance between anterolateral spines). Pterygostomian flap surface smooth; anteriorly produced to spine. Excavated sternum with acute anterior margin and small granule at midlength. Sternite 3 with deep, V-shaped emargination, with distinct notch flanked by submedian spines. Sternite 4 with strong anterolateral spine, not overreaching sternite 3. Antennal article 2 with strong lateral spine; peduncle with article 5 about twice as long as article 4, both unarmed; antennal scale from slightly falling short to slightly overreaching peduncle. Ocular peduncle with concave mesial margin. Cheliped 4–5 × pcl in length; ischium with strong dorsal spine; ventral margin irregular, with or without distinct ventrodistal spine; carpus dorsoventrally depressed; palm massive, inflated. P2–4 propodi with 5–10 spines along distal portion of flexor margin, in addition to distally paired spines; dactyli distally narrowing, with 10–13 sharp triangular spines, obliquely directed, along entire flexor margin; ultimate, penultimate and antepenultimate spines subequal in size.

Colour in life. Pale orange (see Seafloor Image 7).

Remarks. Six specimens of *Uroptychus litosus* have been collected from the Kermadec Ridge, the Bay of Plenty, and the Northland Plateau (906–1217 m, Fig. 105) and a specimen collected at the type locality was also located in the NIC (NIWA 123246). All match the original description by Ahyong & Poore (2004, reproduced in Fig. 104) and subsequent accounts by Baba (2018) who added the character of the anterior margin of the excavated sternum (acute with a small central spine) and the mesial margin of the ocular peduncle, proximal of the cornea (concave in *U. litosus*). The female (NIWA 123246) from Tasmania is the smallest specimen of this species reported to date (at a cl of 7.2 mm it is much smaller than the holotype cl 17.8 mm). Size-related differences include a shorter cheliped (2.5 × cl instead of 3 × as reported for the type series), the ventral and mesial tubercles on the cheliped merus and the transverse row of tubercles across the thoracic sternite 4 are indistinct instead of distinct, and the P2–4 propodi with only five or six spines in addition to the distal pair, which are less than those reported by Ahyong & Poore (2004) but similar to the account by Baba (2018). It otherwise clearly aligns with the description for specimens collected from the same station.

The etymology of the species "Greek word *litós* meaning plain, alluding to the relatively simple, nondescript features of the species" (Ahyong & Poore 2004: 55) highlights the difficulty in separating the 'smooth' species of *Uroptychus*, but with a combination of characters, it can be differentiated from similar species. Morphologically, *U. litosus* appears most similar to *U. aotearoa* **sp. nov.** and *U. bardi* McCallum & Poore, 2013 from Western Australia, differences are discussed under *U. aotearoa* **sp. nov.** The chief difference between *U. litosus* and *U. bardi* is the presence of a field of granules on sternite 4 in *U. bardi* while there is only a single row of tubercles across the sternite in *U. litosus*. Baba (2018), reporting on material from Vanuatu and Wallis and Futuna Islands, also suggests that the differences in the shape of the anterior excavated sternum (angular in *U. litosus* and rounded in *U. bardi*) and the spination of the P2 propodus (seven or eight spines along distal half of margin in *U. litosus* and 9–12 along the entire length in *U. bardi*) are stable.

Based on molecular evidence available so far, *U. litosus* is more similar to species such as *U. nigricapillis* Alcock, 1901, *U. remotispinatus* Baba & Tirmizi,

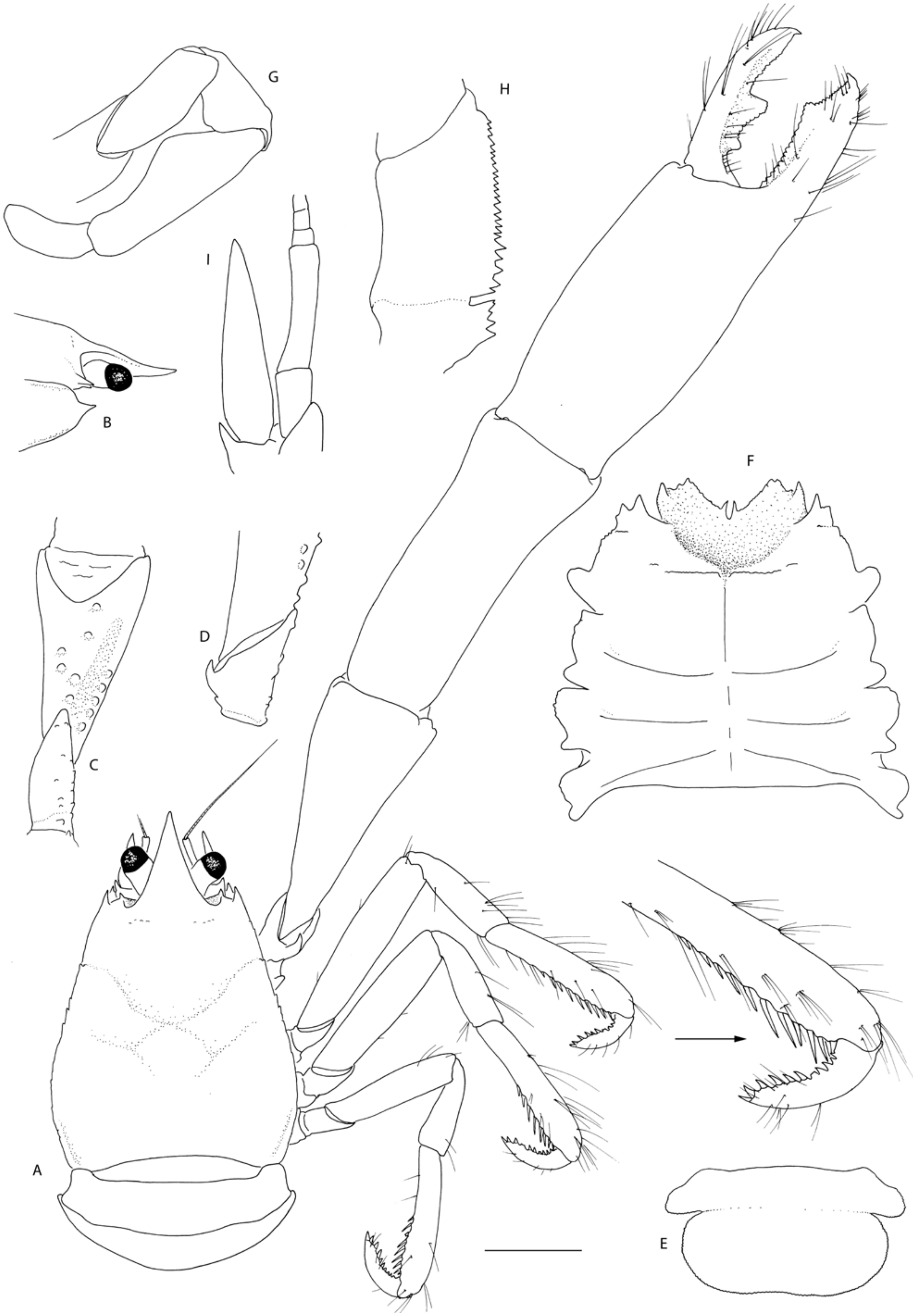
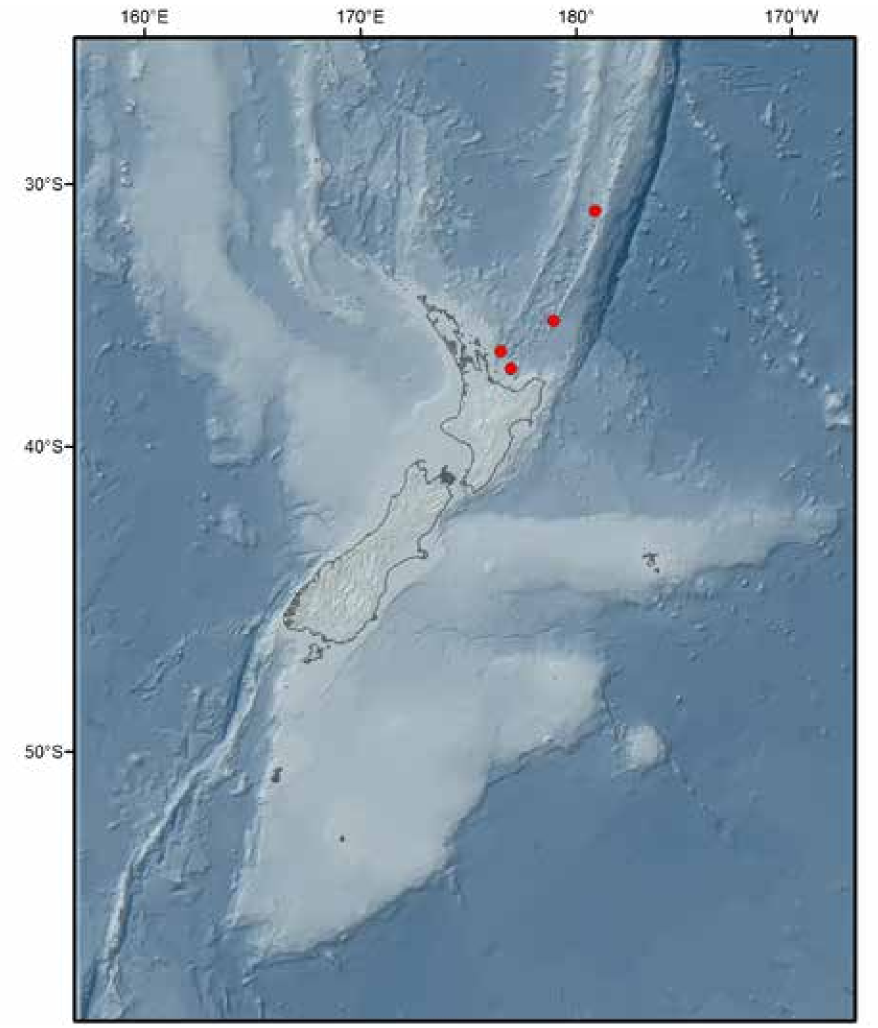


Figure 104. *Uroptychus litosus* Ahyong & Poore, 2004, holotype male, cl 17.8 mm, NMV J52862: **A.** dorsal habitus; **B.** anterior carapace, right lateral; **C.** cheliped merus, right ventral; **D.** cheliped merus, right lateral; **E.** telson; **F.** sternum; **G.** Mxp3, right lateral; **H.** crista dentata, right; **I.** antenna, right ventral. A–B = 5 mm, C–G = 2.5 mm, H–I = 1.3 mm. After Ahyong & Poore (2004).

Figure 105. Distribution of *Uroptychus litosus* Ahyong & Poore, 2004 around New Zealand.



1979 and *U. nitidus* (A. Milne-Edwards, 1880) (see below). *Uroptychus litosus* differs from all of these in having a distinct spine on the anterior point of the pterygostomian flap (small or indistinct on a rounded margin for all others) and it differs from *U. nigricapillis* and *U. remotispinatus* in the spination of the P2–4 propodi, distally paired in *U. litosus* and single in both others. *Uroptychus nitidus* is an Atlantic species, recently redescribed by Baba & Wicksten (2017) who confirm the diagnostic character of an acuminate lateral orbital angle (spiniform in *U. litosus*) and the cheliped carpus noticeably depressed dorsoventrally (subcylindrical in *U. litosus*).

The female (pcl 11.0, NIWA 83318) carried one egg of 1.5 mm diameter and a second female (pcl 10.2 mm, NIWA 127112) carried 16 eggs of 1.2–1.4 mm diameter.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.8% (NIWA 86303 from the Kermadec Ridge closely matches a sequence from NMV J60611 identified as *U. litosus* by Anna McCallum, from south off Tasmania (1060 m), (N. Andreakis pers. comm.). Closest interspecific sequence divergences: 6.1% (*U. nitidus*, USNM LII 2010 GOM 2128), 8.2–8.5% (*U. nigricapillis* Alcock, 1901), 8.8–9.0% (*U. remotispinatus* Baba & Tirmizi, 1979), 9.3% (*U. maori* Baba, 1974), 9.7–9.9% (*U. brevisquamatus* Baba, 1988).

Uroptychus longior Baba 2005 Figs 106, 107

Uroptychus longior Baba 2005: 43, figs 14, 228 (synonymies, key); Baba *et al.* 2008: 36 (list and synonymies); Baba 2018: 279, figs 129, 130.

Type & locality (not examined). Holotype—ZMUC CRU-11075, Bali Sea, 7°29´S, 114°49´E, c. 240 m, male (cl 9.9 mm).

Material examined. *Colville Ridge Volcano, Colville Ridge*: NIWA 86141, NIRVANA Stn TAN1213/19, 30°10.64–10.67′S, 179°44.21–44.56′E, 387–422 m, 18 Oct 2012, 1 female ov. (7.6 mm, pcl 4.6 mm); NIWA 86142, NIRVANA Stn TAN1213/19, 30°10.64–10.67′S, 179°44.21–44.56′E, 387–422 m, 18 Oct 2012, 1 female (7.2 mm, pcl 4.4 mm); NIWA 86090, NIRVANA Stn TAN1213/18, 30°11.19–11.26′S, 179°43.31–43.10′E, 380–440 m, 18 Oct 2012, 1 male (7.0 mm, pcl 4.1 mm).

Colville Ridge: NIWA 86249, NIRVANA Stn TAN1213/22, 30°4.98–4.97′S, 179°49.33–49.63′E, 483–530 m, 18 Oct 2012, 2 females ov. (8.5, 7.9 mm, pcl

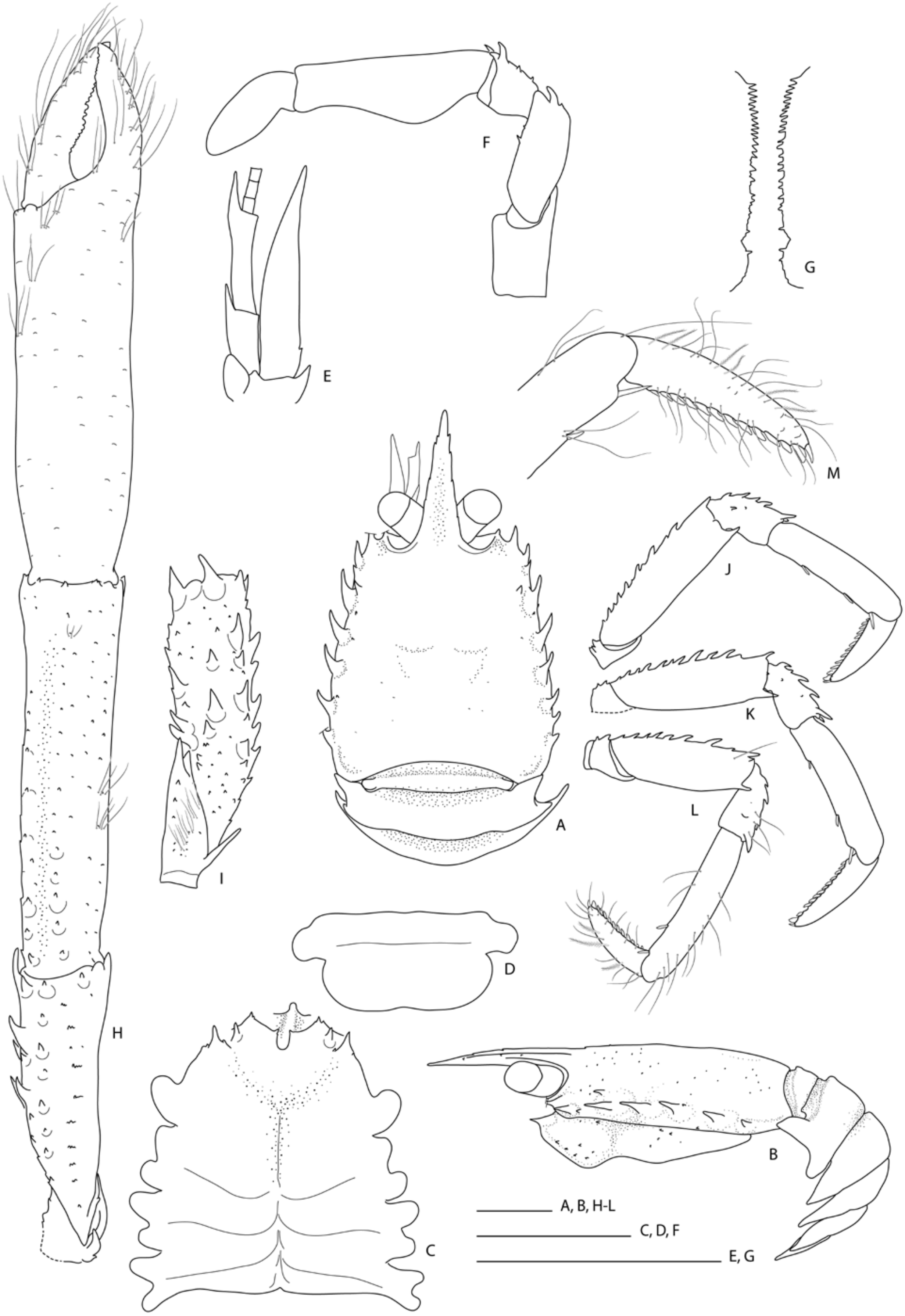
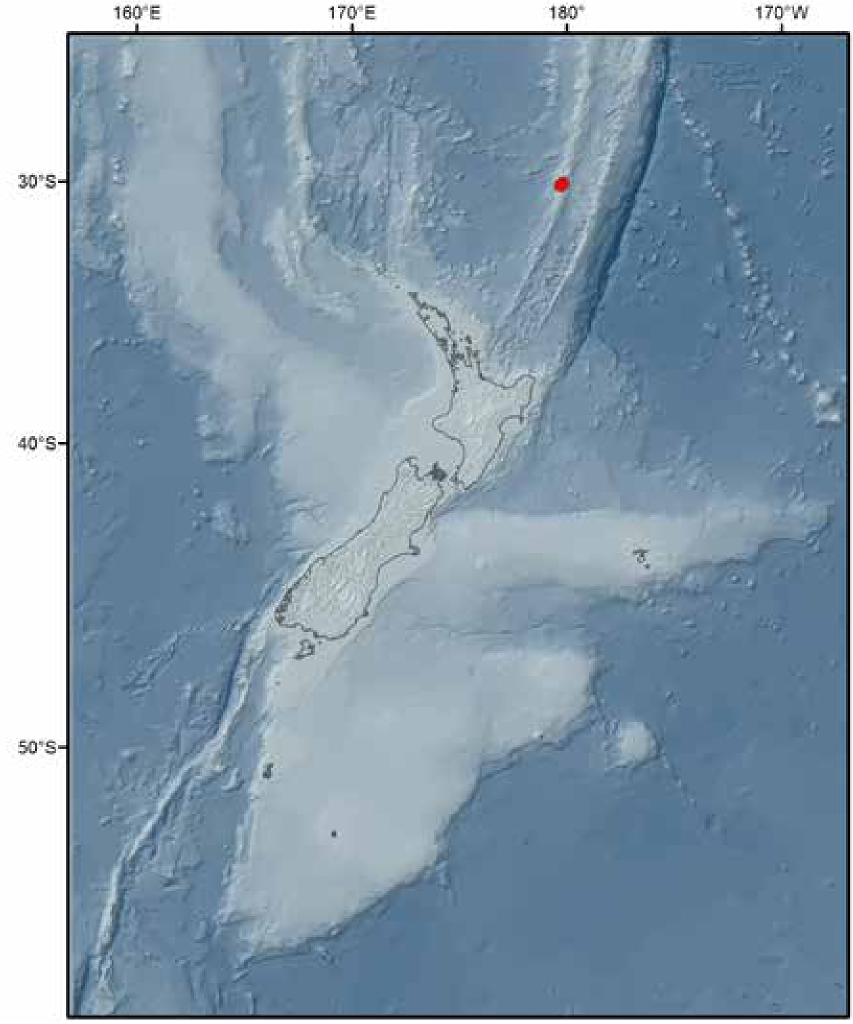


Figure 106. *Uroptychus longior* Baba, 2005, male, NIWA 86249: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left and right Mxps 3; **H.** right cheliped, dorsal; **I.** right cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, P3, lateral. Scale bars = 2 mm.

Figure 107. Distribution of *Uroptychus longior* Baba, 2005 around New Zealand.



5.5, 5.0 mm), 1 female (5.9 mm, pcl 3.2 mm), 3 males (8.7, 7.6, 7.6 mm, pcl 5.5, 4.7, 4.6 mm; 4.7 mm male sequenced, see Fig. 5).

Distribution. Kei Islands, Bali Sea, 240–385 m; Philippines (between Lubang Islands and Luzon), Solomon Islands, Wallis-Futuna Islands, Vanuatu, Chesterfield Islands, New Caledonia, Norfolk Ridge, and Tonga; 227–1434 m (Baba 2018); central Colville Ridge, 380–530 m (Fig. 107).

Habitat. Baba (2005) lists the habitat of the Bali Sea holotype as 'sand and mud with concretions' and the Kei Islands specimens as 'corals & sponges.' Baba (2018) reports some Philippines specimens with primnoid corals. All specimens of *U. longior* examined here were collected from the Colville Ridge in 2012, from small cones on an unnamed ancient volcano summit and on the ridge itself, about 15 km north-east of the volcano (Fig. 107). All stations also recovered up to 50 kg of coral rubble and a range of alcyonacean corals (primnoids, plexaurids, chrysogorgiids, coralliids, and isidids) as well as antipatharians.

Diagnosis. Carapace dorsal surface unarmed (small spines may be present in lateral branchial regions, epigastric region smooth), sparsely setose; with 7 or 8 large lateral spines; anterolateral spine distinctly larger than lateral orbital spine. Rostrum narrow (breadth < 0.5 × distance between anterolateral spines). Abdominal somite 1 with transverse ridge; all tergites and pleura unarmed. Thoracic sternite 3 anterior margin with median notch and submedian spines. Antennal scale overreaching antennal article 5. Mxp3 ischium unarmed, with rounded corner on flexor distal margin. P2–4 meri and carpi with rows of spines along extensor margins, ventral margins smooth; dactyli distally narrowed; with row of 12–14 closely spaced, inclined spines along flexor margin; penultimate spine about twice as broad as antepenultimate spine.

Colour in life. Not known.

Remarks. The nine specimens of *U. longior* only show slight differences compared to previous accounts; these include a range of lateral branchial spines (five or six), instead of a constant six. The illustrated male (NIWA 86249, Fig. 106) bears five branchial spines on the left side and six on the right side. The rostrum is proportionally longer in the smallest female examined (NIWA 86249, #G) at 0.8 × pcl, longer than the typical 0.5–0.6 of other specimens. All specimens had four small distodorsal spines on the cheliped carpus, not noted previously. The size range of the palm is extended with the smallest female examined (NIWA 86249, #G) having a length-width ratio of 2.7, stouter than the range reported previously (2.8–4.9 for females) and the largest male (NIWA 86249, #F) having a length-width ratio of 3.4 which is more massive than the 2.9–3.1 reported for males by Baba (2018).

Uroptychus longior most closely resembles *U. nanophyes* McArdle, 1901, widespread in the eastern Indian Ocean and southwestern Pacific, *U. karubar* Baba, 2018 known from Indonesia to Norfolk Ridge and *U. alophus* Baba, 2018 from Chesterfield Islands and Norfolk Ridge. Distinguishing characters include: the antennal scale overreaches antennal article 5 by another half length of the article in *U. longior*, while it barely reaches the end of the peduncle in *U. nanophyes*; at least the P2 merus bears ventromesial spines, which are absent in *U. longior*; and the dorsal margin of P2 merus bears 13–17 spines in *U. nanophyes*, while *U. longior* has less at 10–11. *Uroptychus longior* can be distinguished from *U. karubar* by the smooth surface of the gastric carapace region (9–11 epigastric spines in *U. karubar*); the posterior branchial margin has four or five spines (three spines in *U. karubar*); the Mxp3 ischium is unarmed (with a small but distinct spine near the distal end of the flexor margin in *U. karubar*). *Uroptychus longior* is distinguished from *U. alophus* by the sharp transverse ridge on abdominal tergite 1, which is absent in *U. alophus*; and the anterior end of the anterolateral margin of sternite 4 is rounded or blunt in *U. alophus*, instead of being acute and produced in *U. longior*. Neither *U. alophus* nor *U. nanophyes* are known from the New Zealand region.

In the key to the New Zealand species, *U. longior* is allied with *U. taranui* **sp. nov.** and *U. chathami* **sp. nov.** but can be easily distinguished by the following characters: the rostrum has a few lateral serrations; the extensor margin of the P2–4 propodi is unarmed and abdominal tergite 1 has a sharp transverse ridge in *U. longior*, while both *U. taranui* **sp. nov.** and *U. chathami* **sp. nov.** have a distinct pair of subapical spines; at least two proximal spines; and a blunt transverse ridge on tergite 1. Also, *U. longior* lacks the fine setation, while both *U. taranui* **sp. nov.** and *U. chathami* **sp. nov.** are distinctly setose.

DNA sequence data. Interspecific sequence divergences for partial CO1 gene: >10% (one female, NIWA 86249).

Uroptychus longvae Ahyong & Poore, 2004

Figs 108, 109

Uroptychus longvae Ahyong & Poore, 2004: 58, fig. 16; Poore 2004: 226 (compilation); Baba 2005: 228 (synonymies, key); Baba *et al.* 2008: 36 (synonymies); Webber *et al.* 2010: 225 (list); Baba 2018: 283, fig. 131.

Type & locality (not examined). Holotype—SAM C6064, 34°56′S, 133°20′E, W of Cape Wiles, Great Australian Bight, 805–816 m, female ov. (cl 13.7 mm).

Material examined. *Sister 1 Seamount, off Tasmania (Australian EEZ)*: NIWA 23386, CSIRO Stn SS0197/14, 44°16.80–17.40′S, 147°16.20–12.60′E, 1000 m, 23 Jan 1997, 1 male (11.0 mm, pcl 7.8 mm).

Status uncertain. *Uroptychus* cf. *longvae*: NIWA 23132, SOP Stn Z9181, Bay of Plenty, 37°01′S, 176°43′E, 972 m, 20 Jul 1998, 1 female ov. (11.0 mm, pcl 7.5 mm).

Chatham Rise, *Diamond Head Seamount*: NIWA 53685, NIWA Stn TAN0905/99, 44°08.38–08.54′S, 174°43.18–43.56′W, 641–758 m, 26 Jun 2009, 1 male (9.4 mm, pcl 6.5 mm; sequenced, see Fig. 5).

Distribution. South Australia, 805–816 m; Norfolk Ridge, 630–1150 m (Baba 2018); Bay of Plenty and Chatham Rise, 641–972 m (Fig. 109).

Habitat. Unknown.

Diagnosis. Carapace excluding rostrum distinctly broader than long, lateral margins unarmed, distinctly convex, broadest posterior to midlength; with distinct anterolateral spine; outer orbital angle rounded or with small granule but without distinct spine; dorsal surface unarmed. Rostrum long triangular, relatively narrow (width < 0.5 × distance between anterolateral spines at base), extending far beyond ocular peduncle. Anterior margin of thoracic sternite 3 with deep V-shaped excavation; anteriorly rounded. Antennal articles unarmed; antennal scale reaching or slightly overreaching midlength of article 5. Cheliped about 2.5–3 × as long as cl; propodal palm about 2.5 × as long as fingers. P2–4 propodi curving, entire, not inflated on flexor margin; dactyli tapering distally, long, more than 3/4 length of propodus; strongly curving, flexor margin with 18–23 small and slender spines (longer than broad), arranged nearly perpendicular to margin, distal group of spines subequal in size.

Colour in life. Unknown.

Remarks. *Uroptychus longvae* Ahyong & Poore, 2004 belongs to a group of species that have an unarmed carapace, spineless flexor margins of the P2–4 propodi, a relatively long rostrum and long and greatly curving dactyli with more than 17 spines along the flexor margin. This group includes *U. patulus* Ahyong & Poore, 2004, from southern Australia, *U. onychodactylus* Tirmizi, 1964 from the Maldives and *U. setosidigitalis* Baba, 1977a from Midway Island, but distinguishing characteristics between them are slight (discussed below). The New Zealand specimens of *U. longvae* (NIWA 23132 and NIWA 53685) align most closely with *U. longvae* represented also by a reference specimen collected on a Tasmanian seamount (CSIRO Stn SS0197/14, NIWA 23386). The specimen matches

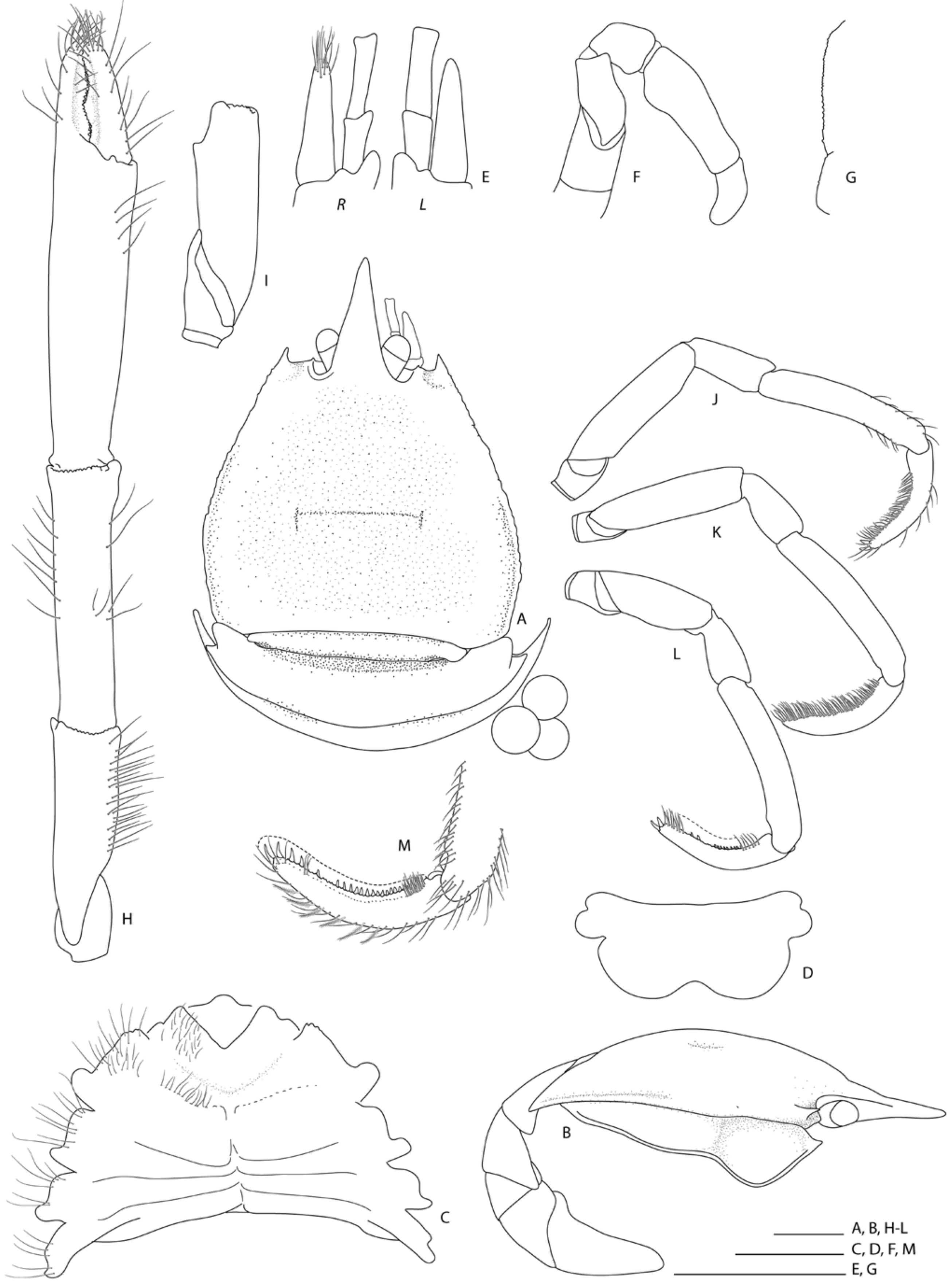


Figure 108. *Uroptychus* cf. *longvae* Ahyong & Poore, 2004, female, NIWA 23132: **A.** carapace and abdomen, dorsal, with three eggs; **B.** carapace and abdomen, lateral, setae omitted; **C.** sternal plastron; **D.** telson, setae omitted; **E.** antenna, right and left, ventral; **F.** right Mxp3 endopod, lateral; **G.** crista dentata of left Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped, ischium and merus, lateral; **J–L.** right P2–4; **M.** dactylus and distal portion of propodus of right pereopod 2. Scale bars = 2 mm.

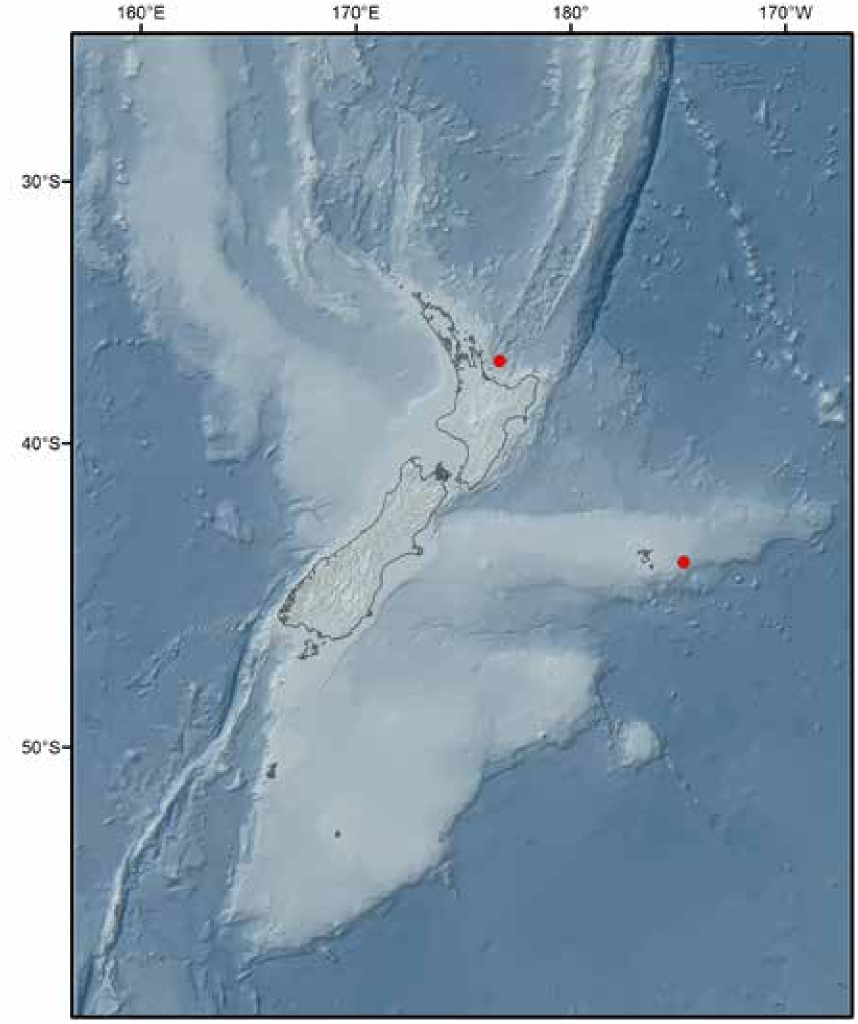


Figure 109. Distribution of *Uroptychus* cf. *longvae* Ahyong & Poore, 2004 around New Zealand.

the description by Ahyong & Poore (2004) well, except for a more rounded rostral tip and the presence of a small granule on the lateral orbital angle (instead of being entirely rounded). However, the New Zealand specimens include several characters that place it neither entirely with *U. longvae* nor with the other members of this group and it appears genetically divergent (see below). The diagnostic characters for this group may need revision and clarification before these two specimens may either be placed with existing species or described as a new species. Until then, the New Zealand specimens are provisionally placed in *U. longvae* and NIWA 23132 is illustrated here (Fig. 108). The diagnosis for *U. longvae* is expanded to account for these specimens.

The New Zealand material has the following characters:

- *U. longvae* and *U. patulus* are united by the rounded lateral orbital margin and the two specimens clearly have a small granule. However, the *U. longvae* specimens from Tasmania and New Zealand have a minute granule on an otherwise rounded margin, indicating that this character may be more variable in this species and should be examined in more detail;
- the pterygostomian flap frontal margin is rounded in *U. longvae* s. s. and *U. patulus* and appears slightly variable in the New Zealand specimens, clearly with a small anterior spine in the female ov. (NIWA 23132) and angular, with a minute granule in the male (NIWA 53685);
- the antennal scale slightly overreaches the midlength of antennal article 5 in the female ov. (NIWA 23132), similar to *U. setosidigitalis* but in the male (NIWA 53685), it reaches only the midlength, similar to *U. longvae*, *U. patulus*, and *U. setosidigitalis*;
- the cheliped in the female ov. (NIWA 23132) is about 2.5 × the cl. This is intermediate to the ratio reported for *U. longvae*, *U. onychodactylus,* and *U. setosidigitalis* (about 3 × cl), or for *U. patulus* (2 × cl). This character is of course subject to considerable sexual dimorphism. The chelipeds are missing in the male (NIWA 53685);
- the P2–4 dactyli have 20–23 spines along the flexor margin, slightly more than the 17–20 reported for *U. longvae* by Ahyong & Poore (2004) and more within the range reported for *U. patulus* (20–30 spines).

In the following characters the Tasmanian specimen aligns with *U. longvae sensu stricto* but these may need to be verified in more detail with the type material in the future: comparing the sternal plastron, the length-width ratio is subequal in *U. longvae* and *U. patulus*, but it appears widest along the posterior region around sternite 7 in *U. longvae* and slightly more anterior, around sternite 6 in *U. patulus*. The lateral margin of sternite 3 is concave in *U. longvae* and straight in *U. patulus* (this character is not commonly used as a diagnostic character). According to Ahyong & Poore (2004, fig. 20), the dactylus of P4 is longer than those of P2 and P3 in *U. patulus* while all dactyli are subequal in length in *U. longvae*. P2–4 dactylar spines are longer than broad, similar in *U. longvae*, while they are broader than long in *U. patulus*.

Baba (2018) reported *U. longvae* from 630–1150 m on the Norfolk Ridge but the chelipeds were missing. It shares with the New Zealand *U.* cf. *longvae* the acute lateral orbital angle, the shape of the dactylus of the walking leg and the comparably deeply excavated anterior margin of sternum 3 illustrated.

DNA sequence data. Sequence divergences for partial CO1 gene: The male from the Andes Seamount Complex (NIWA 53685) differed 10.8% compared to a sequence from *Uroptychus longvae* collected from the Cascade Plateau (NMV J60612) (N. Andreakis, pers. comm.); this typically exceeds intraspecific divergence levels. Closest interspecific sequence divergences for partial CO1 gene: ~8.5% (*U. macquariae* Schnabel, Burghardt & Ahyong, 2017, 8% (*U. insignis*), 9.5% (*U. torrancei* **sp. nov.**). These species are all different with regards to their carapace and pereopodal morphology, but they all share the deeply V-shaped anterior excavation of the sternum.

Uroptychus macquariae Schnabel, Burghardt & Ahyong, 2017 Figs 110–112

Uroptychus insignis, Ahyong, Schnabel, Baba, 2015: 111, figs 1–4, 5A (part). [Not *U. insignis* (Henderson, 1885)]
Uroptychus macquariae Schnabel, Burghardt & Ahyong, 2017: 330–334, figs 4–6.

Material examined. Holotype—AM P100957 (ex NIWA 124189), NIWA Stn TAN0803/98, 56°14.78–14.49′S, 158°30.34–30.9′E, Hjort Seamount, Macquarie Ridge, Australian EEZ, 676–750 m, 16 Apr 2008, 1 female ov. (15.9 mm, pcl 10.5 mm; sequenced, see Fig. 5). Paratypes—*Hjort Seamount*, *Macquarie Ridge (Australian EEZ)*: NIWA 40904 (sequenced, see Fig. 5), locality details same as for holotype, 1 female (8.7 mm, pcl 5.5 mm), 2 males (18.1, 12.0 mm, pcl 11.8, 7.4 mm) (all sequenced, see Fig. 5).

Other material. *Subantarctic New Zealand region*, *Bounty Plateau*: NIWA 123235, SOP Stn TRIP2416/54, 47 28′S, 177 01′E, 720–741 m, 28 Apr 2007, 1 female (damaged, pcl ~9.5 mm), picked from black coral, *Cladopathes* sp.

Subantarctic New Zealand region, *Campbell Plateau*: NIWA 65638, SOP Stn TRIP2718/122, 47 32′S, 177 56′E, 834–1014 m, 25 Nov 2008, 3 females ov. (15 mm, two with rostrum damaged, pcl 10.5, 9.8, 9.5 mm), 5 females (13.2, 12.3, 9.5 mm, two with rostrum damaged, pcl 10.9, 9.9, 9.5, 7.3, 5.8 mm), 1 male (12.6 mm, pcl 8.0 mm).

Type locality. Hjort Seamount, Macquarie Ridge, 676–750 m.

Distribution. Hjort Seamount, Macquarie Ridge, Campbell Plateau, Bounty Plateau, 676–1014 m (Fig. 112).

Habitat. Subantarctic seamounts and plateaus of the Southern Pacific. Although no records are available on possible faunal associations of *U. macquariae*, Schnabel *et al.* (2017) argued that it is likely that the species could live in association with the prevalent gorgonian and hard corals that were commonly observed on the Macquarie Ridge seamounts. Collection notes for both additional samples examined here indicate that the specimens were picked off the black coral (*Cladopathes* sp.), which support this.

Diagnosis. Carapace excluding rostrum wider than long; dorsum smooth, sparsely setose, with transverse row of strong epigastric spines in large specimens (in large specimens epigastric spines as large as adjacent branchial marginal spines); lateral margins divergent, spinose, anterolateral spine overreaching outer orbital spine; lateral hepatic margin with small spinules, anterior branchial spine separated from remaining branchial spines by wide unarmed margin (occasionally with one or two much smaller spines). Rostrum narrow and sharply triangular, margins unarmed or with few minute denticles. Thoracic sternite 3 anterior margin with deep, V-shaped median emargination. Antennal article 2 with small outer spine; articles 4 and 5 each with distal spine. Antennal scale falling short of apex of article 5. Ocular peduncle relatively short, 1.8–2.0 × as long as wide. Mxp3 crista dentata uniformly and minutely dentate. Cheliped spinose; merus with strong spines on mesial margin. P2–4 similar; merus with small spines on extensor margin; propodus flexor margin broadened distally and lined with movable spines, distally paired; dactylus distally narrowed, flexor margin lined with strong, obliquely directed, corneous spines, distal group subequal in size.

Colour in life. Uniformly red (Fig. 110).

Remarks. *Uroptychus macquariae* Schnabel, Burghardt & Ahyong, 2017 was recently described from two lots collected from separate seamounts on

Figure 110. *Uroptychus macquariae* Schnabel, Burghardt & Ahyong, 2017, paratype male, NIWA 40904, Stn TAN0803/9,8 Hjort Seamount, Macquarie Ridge (Australian EEZ). Scale = 2 mm. Image courtesy of Julian Finn, Museum Victoria.

the Macquarie Ridge, which were initially identified as *U. insignis* (Henderson, 1885) by Ahyong, Schnabel & Baba (2015). These two species morphologically vary only subtly but are clearly genetically distinct and represent two high-latitude lineages occupying the Subantarctic seamounts and plateaus of the southern Pacific and the Indian Ocean, respectively (holotype figure reproduced in Fig. 111).

Two further samples have since been uncovered, both from the Bounty Plateau, which extends the distribution of *U. macquariae* beyond the Macquarie Ridge onto the New Zealand continental shelf (Fig. 112). Many of the specimens are damaged and most pereopods are detached but they match the diagnostic characters.

Uroptychus macquariae is comparably less setose than *U. insignis*, especially on the chelipeds and carapace, and large specimens bear more pronounced epigastric spines. In size-matched specimens, the spines of the *U. macquariae* specimens are larger and the largest epigastric spines as large as, instead of smaller than, the adjacent branchial marginal spines, as in *U. insignis*. Application of this character is difficult in the smallest specimens in which the epigastric armature is yet to appear. It is notable that the smallest specimen of the new material examined here (female, pcl 5.8 mm, NIWA 65638) still bears small but distinct epigastric spines which are larger than the smaller female of *U. insignis* illustrated by Ahyong *et al.* (2015). An additional useful taxonomic character, but with a degree of overlap, is the length of the antennal scale, which never reaches the end of the peduncle in *U. macquariae*, but which reaches or overreaches the end of the peduncle in *U. insignis*. Indications that the eyes

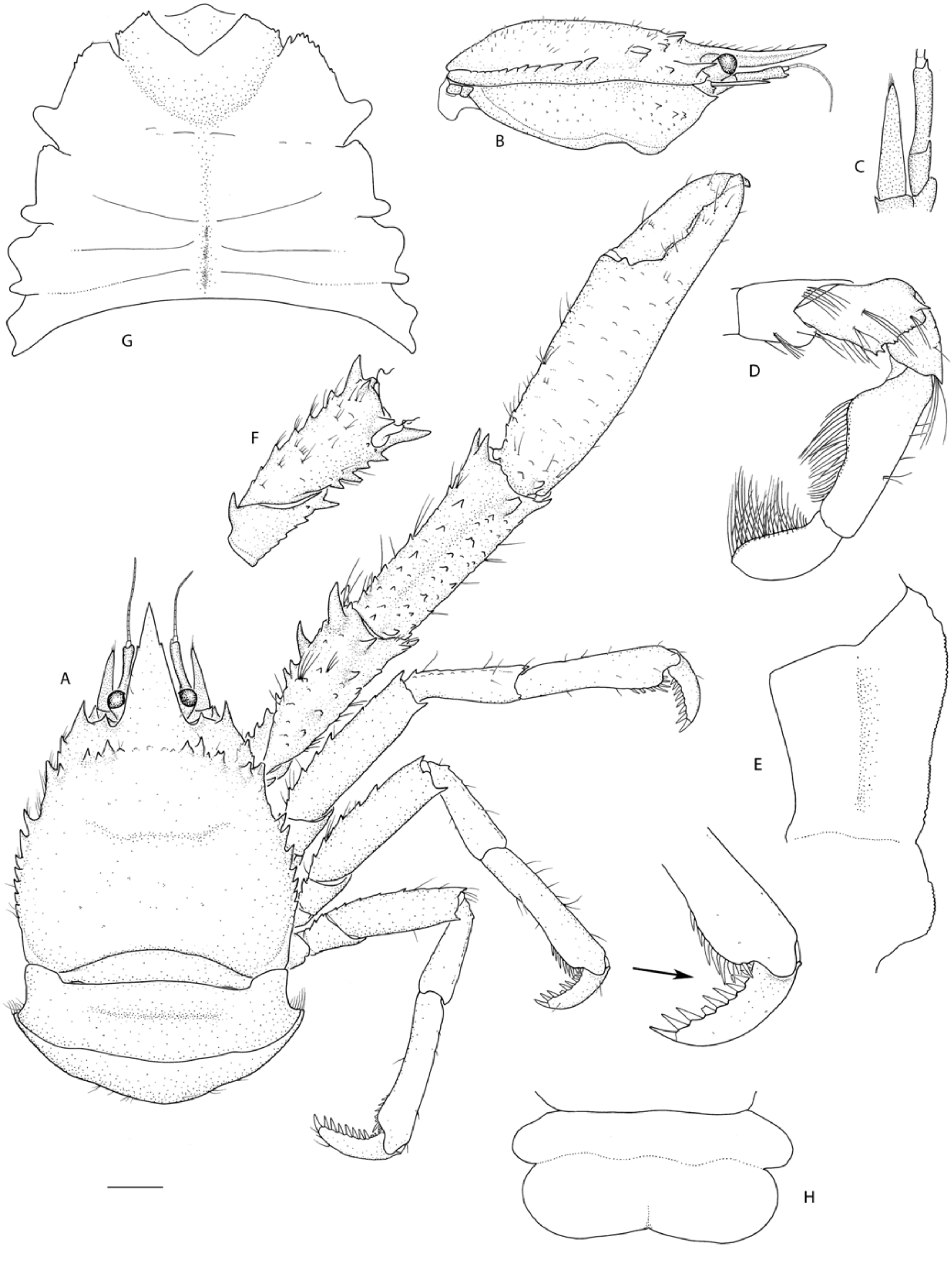
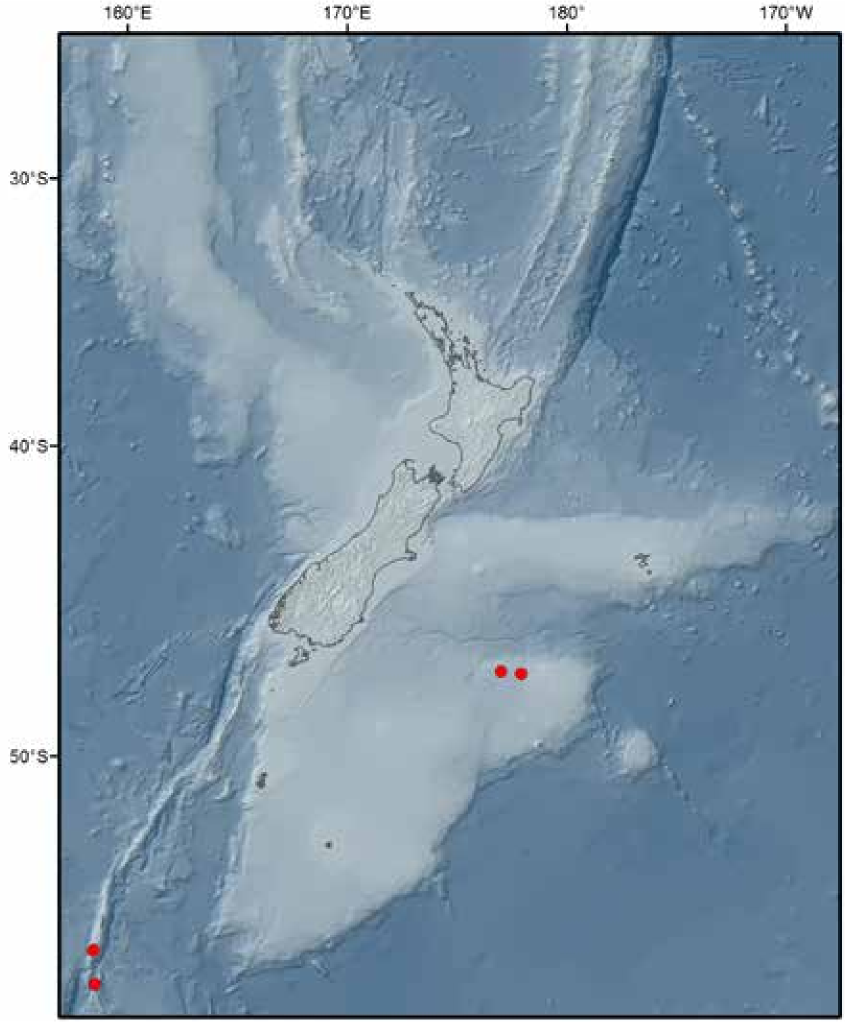


Figure 111. *Uroptychus macquariae* Schnabel, Burghardt & Ahyong, 2017, holotype female ov., AM P100957: **A.** dorsal habitus; **B.** carapace, right lateral; **C.** right antenna, ventral view; **D.** right Mxp3, lateral; **E.** right crista dentata; **F.** right cheliped ischiomerus, mesial; **G.** excavated sternum and sternal plastron; **H.** telson. Scale: A, B, F = 2.5 mm; C, D, G, H = 1.25 mm; E = 0.5 mm. Modified from Schnabel, Burghardt & Ahyong (2017).

Figure 112. Distribution of *Uroptychus macquariae* Schnabel, Burghardt & Ahyong, 2017 around New Zealand.



may be more slender in *Uroptychus macquariae* (the ocular peduncle is 1.8–2.0 × as long as wide compared to 1.4–1.5 in *U. insignis*) and that the antennal scale width compared to the width of the antennal article 5 differs (1.1–1.7 × wider compared to 1.8–2.1 in *U. insignis*) must await collection of further comparative material.

Both *Uroptychus insignis* and *U. macquariae* most closely resemble *U. zeidleri* Ahyong & Poore, 2004, from Tasmania and *U. spinulosus* Dong & Li, 2015 from Taiwan. They differ from *U. zeidleri* in the branchial marginal carapace spination; these are arranged in a single, even, uninterrupted row in *U. zeidleri,* while the anterior branchial spine is separated from the remainder by an unarmed interval, or at most with one or two small, well-spaced spines in *U. insignis* and *U. macquariae*. The dentition of the crista dentata also differs (denticles are evenly decreasing in size distally in *U. zeidleri*; the teeth are uniformly minute in *U. insignis* and *U. macquariae*).

Uroptychus spinulosus has the antennal article 2 indistinctly armed, while it is armed with a distinct lateral spine in both *U. insignis* and *U. macquariae*; the antennal scale reaches the end of article 5 in *U. spinulosus* and *U. insignis*, never in *U. macquariae*. The cheliped merus is armed with a single large spine along the mesial margin in *U. spinulosus*, compared to a row of multiple spines in both *U. macquariae* and *U. insignis*, and the lateral hepatic carapace region is unarmed in *U. spinulosus*, while it bears 1 or 2 small spines even in small specimens of both *U. insignis* and *U. macquariae*.

Comparing CO1 sequence data for *U. macquariae* and *U. insignis* with other species of *Uroptychus* indicates a closer association to species such as *U. torrancei* **sp. nov.**, *U. longvae* Ahyong & Poore, 2004 and *U. megistos* Baba, 2018, see below. All these species share the deep V-shaped anterior sternum and the distal spination of the P2–4 dactyli with all spines subequal in size, indicating that these characters might be phylogenetically informative. Species that are likely to be added to this group but are not available for molecular analysis are *U. proberti* **sp. nov.** and *U. ritchie* **sp. nov.**, all of which are reported for the New Zealand region. *Uroptychus macquariae* differs from all of these by the presence of epigastric spines (although they are obsolescent in small specimens); the other species have a smooth dorsal surface, but *U. ritchie* **sp. nov.** has a few scattered tubercles along the epigastric region and small, paired spines placed directly mesial to the anterior branchial spine. In addition, *U. macquariae* has the P2–4 propodal flexor margin expanded on all walking legs; in the other species the distal propodus can be distinctly inflated (*U. megistos*), slightly inflated (*U. proberti* **sp. nov.**) or not inflated (*U. ritchie* **sp. nov.**), but P3 and P4 are not distinctly inflated in any of these species.

DNA sequence data. Previously presented by Schnabel *et al.* (2017), sequences are deposited on NCBI GenBank (MG029532–MG029535) and Barcode of Life Database (DECNZ384-17–DECNZ387-17). Intraspecific sequence divergences for partial CO1 gene: 1.2–1.4% (four specimens). Closest interspecific sequence divergences: 7.1–7.3% (*U. insignis*), 8.2–8.4% (*U. torrancei* **sp. nov.**), 8.5% (*U. longvae*).

Uroptychus maori Borradaile, 1916 Figs 113–115

Uroptychus maori Borradaile, 1916: 92, fig. 6; Baba *et al.* 2008: 36 (list and synonymies); Schnabel 2009a: 555, figs 8, 9; Schnabel 2009b: 28 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list); Baba 2018: 297, figs 139, 140.

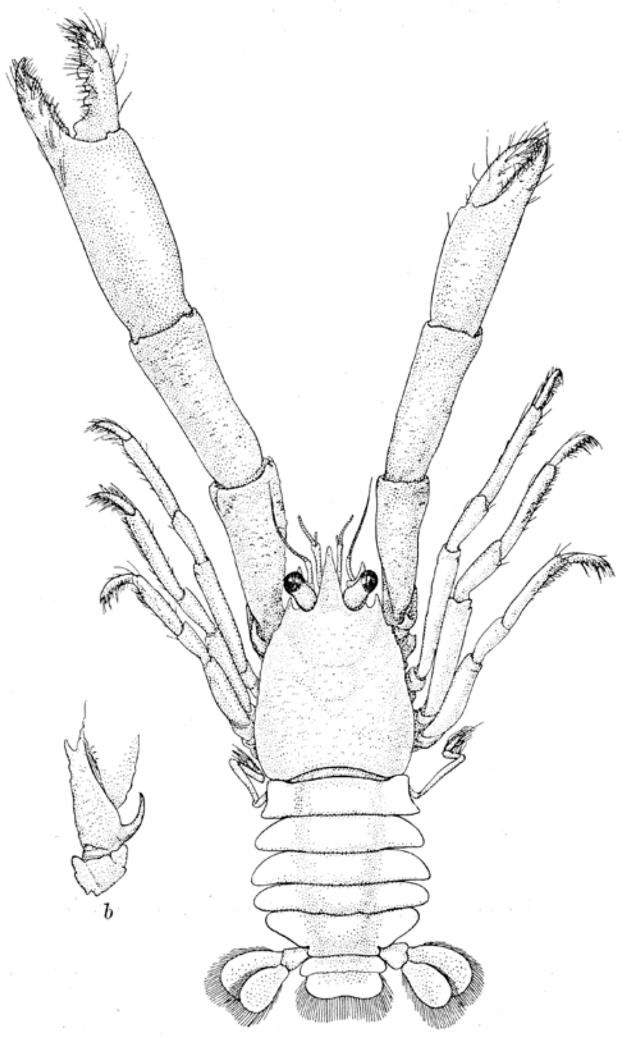
Material examined. *West Norfolk Ridge*: NMNZ CR.012082, NORFANZ Stn TAN0308/154, 34°37.20′–37.68′S, 168°57.03′–58.09′E, 521–539, 3 Jun 2003, 2 males (12.0 mm, pcl 9.0 mm, carapace of second specimen mostly missing; both sequenced, see Fig. 5).

Type & locality. Holotype—NHMUK 1917.1.29.116, *Terra Nova* Stn 90, 34°15.60′S, 174°6.00′E, off Three Kings Islands, 183 m, male (cl 12.9 mm).

Distribution. Loyalty Ridge, Hunter-Matthew and Norfolk Ridge; Three Kings Islands, West Norfolk Ridge, and Bay of Plenty, 183–700 m (Fig. 115).

Habitat. Unknown.

Diagnosis. Carapace as long as broad (without rostrum), finely granulated on dorsal surface, unarmed; lateral margin convexly divergent; anterolateral spine large, overreaching lateral orbital spine; remaining lateral margin without spines but irregular, posterior portion with ridge. Rostrum narrow, triangular, 0.4 × remainder of carapace length. Pterygostomian flap with distinct spine on anterior margin; granulate on surface. Sternal plastron wider than long along midlength, sternite 3 anterior margin deeply excavate, with median notch and submedian spines, anterolateral corner produced to blunt angular point; sternite 4 with distinctly convex anterolateral margin. Abdomen unarmed. Antennal article 2 with small distolateral spine; article 4 with short blunt distomesial spine; article 5 unarmed; antennal scale reaching midlength or nearly reaching end of article 5. Cheliped ischium with very large curved dorsal spine, ventrally with distinct distal spine; merus ventrally tuberculate and dorsally granulate. Pereopods 2–4 meri and carpi smooth along dorsal margins; carpi subequal in length; propodi with flexor margins straight, bearing row of 6–12 spines along less than distal three-quarters, distally paired; dactyli distally narrowed, dactylus-carpus length ratio ≥ 0.7; with 10–13 stout triangular spines along entire length; almost perpendicular to flexor margin, distal 3 subequal in size; extensor margin with fringe of plumose setae.



b

a

Figure 113. *Uroptychus maori* Borradaile, 1916, holotype male, NHMUK 1917.1.29.116: a, dorsal view; b, left cheliped ischium, lateral view. After Borradaile (1916).

Colour in life. Unknown.

Remarks. Schnabel (2009a) reviewed available material of *U. maori* and no further specimens have since been collected in the New Zealand region. The report included comments on the variation of the specimens and compared *U. maori* with congeners *U. brucei* Baba, 1986, *U. litosus* Ahyong & Poore, 2004 and *U. occidentalis* Faxon, 1893, of which *U. litosus* is now also reported from New Zealand waters. More recently, Baba (2018) reported on six specimens of *U. maori* collected on the Norfolk and Loyalty ridges and off

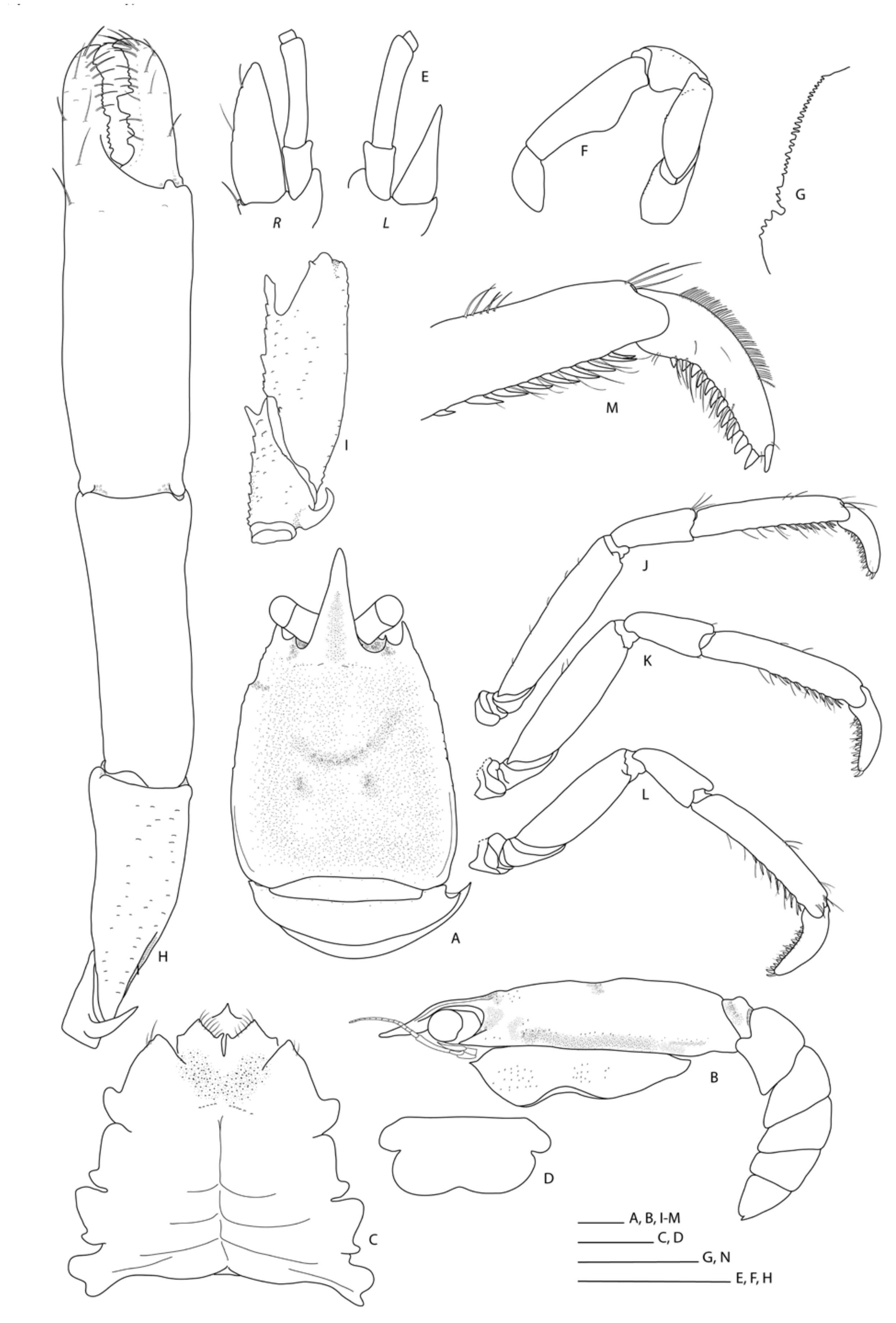
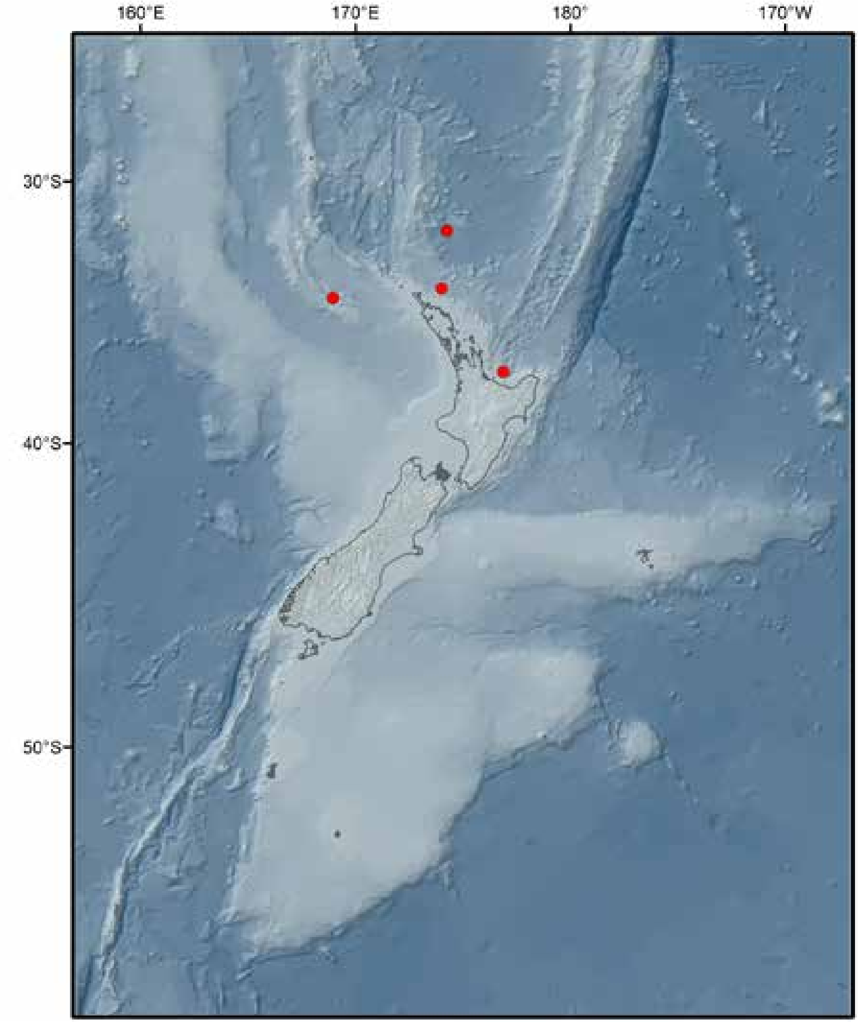


Figure 114. *Uroptychus maori* Borradaile, 1916, holotype male, NHMUK 1917.1.29.116: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** Mxp3 endopod, left, ventral; **G.** crista dentata of left Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped, ischium and merus, lateral; **J–L.** right P2–4; **M.** dactylus and distal portion of propodus of right pereopod 3. Scale bars = 2 mm. Adapted from Schnabel (2009).

Figure 115. Distribution of *Uroptychus maori* Borradaile, 1916 around New Zealand.



the Hunter-Matthew Islands, including comparative remarks on *U. brachydactylus* Tirmizi, 1964, *U. brucei* and *U. granulipes* Baba, 2018. Other species that should be considered in the comparison with *U. maori* are *U. anacaena* Baba & Lin, 2008 from Taiwan and now *U. nirvana* **sp. nov.** *Uroptychus maori* differs from all these species in the presence of a prominent, curved ventromesial spine of the cheliped ischium, the tip of which overreaches the joint between the cheliped merus and ischium (Figs 113b, 114I). Differences between *U. maori* and *U. nirvana* **sp. nov.** are discussed below under the account of that species.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.2% (two specimens). Closest interspecific sequence divergences: 8.5–8.7% (*U. remotispinatus*), 9.7% (*U. brevisquamatus*), 9.3–10.0% (*U. nigricapillis*), 10.0% (*U. aotearoa* **sp. nov.**, compared to 17.3% divergence compared with morphological most similar *U. nirvana* **sp. nov.**

Uroptychus megistos Baba, 2018 — Figs 116–118

Uroptychus paracrassior, Schnabel 2009b: 29 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list). [Not *U. paracrassior* Ahyong & Poore, 2004]

Uroptychus megistos Baba, 2018: 304, figs 143, 144.

Type & locality (not examined). Holotype—MNHN-IU-2014-16726, MUSORSTOM 8 Stn CP983, 19°21.61′S, 169°27.76′E, Vanuatu, 480–475 m, 23 Sep 1994, female ov. (pcl 5.2 mm).

Material examined. *South Norfolk Ridge*: NMNZ CR.022693, NORFANZ Stn TAN0308/136, 33°23.59–23.43′S, 170°12.37–11.74′E, 469–490 m, 1 Jun 2003, 1 male (6.4 mm, pcl 4.1 mm; sequenced, see Fig. 5); NMNZ CR.022686, NORFANZ Stn TAN0308/126, 33°23.59–23.43′S, 170°12.37–11.74′E, 469–526 m, 31 May 2003, 1 female (6.1 mm, pcl 4.1 mm), 1 male (5.8 mm, pcl 3.7 mm), picked from black coral.

Distribution. Vanuatu and Solomon Islands, 418–480 m; reported here from Reinga Ridge, 469–526 m (Fig. 118).

Habitat. One specimen (NMNZ CR.022686) was taken from a black coral, which may indicate an association.

Diagnosis. Carapace broader than long (1.2–1.4 ×); dorsal surface unarmed; lateral margin with distinct row of spines. Rostrum narrow (width < 0.5 × distance between anterolateral spines at base); lateral margin smooth. Pterygostomian flap anterior margin with sharp spine, not flanked by 2 spines along dorsal margin. Anterior margin of thoracic sternite 3 deeply

Figure 116. Live coloration of *Uroptychus megistos* Baba, 2018, NMNZ CR.022686, Stn TAN0308/126.

concave, with median notch but lacking submedian spines. Antennal article 2 with rudimentary to small spine; articles 4 and 5 each with distal spine. Cheliped merus tuberculate to spinose mesially and ventrally; carpus with a few tubercles and small spines scattered on dorsal surface, dorsodistally at most with small spines. P2–4 meri unarmed; propodi with flexor margin distinctly or somewhat inflated on P2, progressively less inflated on P3–4, with 3–7 spines proximal to distal pair of spines; dactyli distally narrowed, flexor margin with 6 or 7 large, sharp spines, obliquely angled, distal 3 subequal in size.

Colour in life. Pale transparent orange base colour on carapace and pereopods, red pigmentation along lateral and posterior carapace edges and a distinct transverse line across epigastric region. Gastric region pale, posterior branchial and intestinal regions lightly pigmented. Abdomen transparent with exception of a median and lateral row of red pigmentation. A transverse red bar in distal portions of cheliped and walking leg articles (Fig. 116).

Remarks. Three specimens align with *U. megistos* Baba (2018) from Vanuatu and the Solomon Islands, although slight differences are observed as follows:

- the material examined is slightly smaller than that reported by Baba (2018) which comprised two males (pcl 4.3, 6.0 mm) and two ovigerous females (5.2, 6.6 mm). The two males examined here (pcl 3.7 and 4.1 mm) are slightly smaller than those reported by Baba (2018) and the non-ovigerous female has a pcl of 4.1 mm. This may explain some of the differences which tend to be size-dependent, such as the slightly narrower carapace length-width ratio of 1.2–1.3 compared to 1.3–1.4 in the type series, the proportionately longer rostrum (0.5–0.6 × pcl instead of <0.5), the different proportion of the sternal plastron (at most 1.5 × wider than long versus twice as wide than long for the ovigerous female holotype) and the slightly shorter cheliped proportions at 4.2 × pcl for the male (NMNZ CR.022693) and 3.5 × for the female (NMNZ CR.022686). Baba (2018) reported the range for males at 4.8–5.9 × pcl, and 4.0–4.9 × pcl for females;
- the pterygostomian flap appears smooth in two specimens and bears a few minute tubercles in the male from station 136 (NMNZ CR.022693). The types have "the anterior surface with several spinules" (Baba 2018: 305);
- the Mxp3 carpus bears a distinct distolateral spine and one or two proximal tubercles, no spine in the type series;
- the cheliped spination appears more pronounced with strong spines along the mesial margins of the

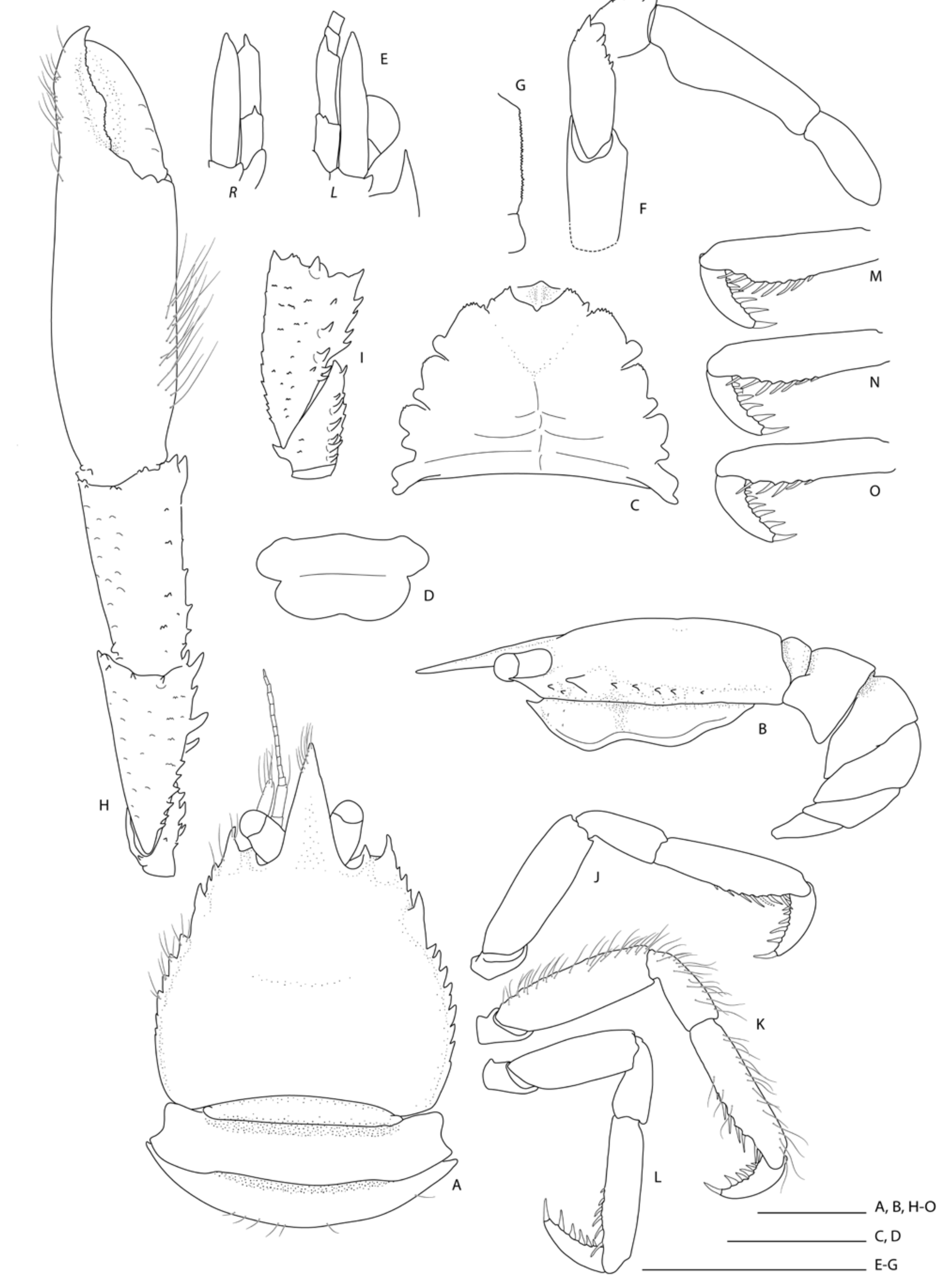
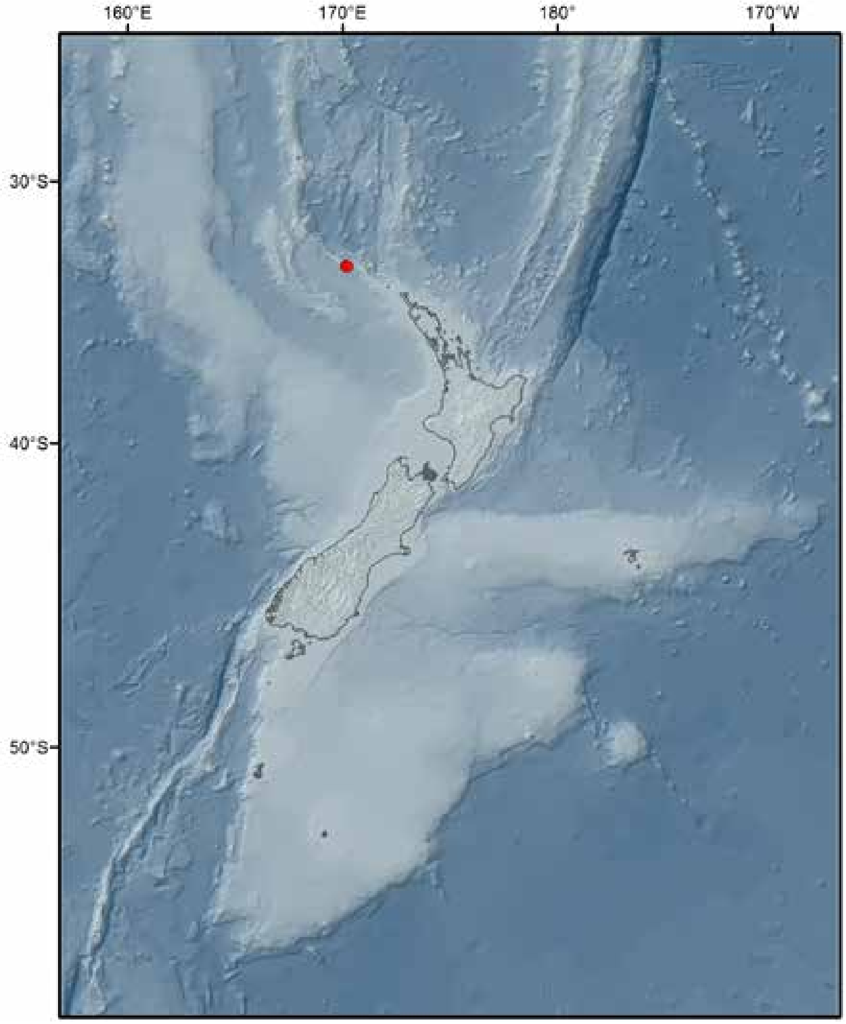


Figure 117. *Uroptychus megistos* Baba, 2018, A–L, female, NMNZ CR.022686; M–O, male, NMNZ CR.022693: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of right Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M–O.** propodus and dactylus of left P2–4. Scale bars = 2 mm.

Figure 118. Distribution of *Uroptychus megistos* Baba, 2018 around New Zealand.



ischium and merus and distally along the meri and carpi compared to the holotype illustrated by Baba (2018: fig. 143);

- the propodus flexor margins of the walking legs are described as distinctly convex but Baba (2018: fig. 144) shows a pronounced inflation on P2 and diminishing inflation on P3 and P4 with the margin of the last walking leg only slightly widened. This variation is reflected in the material examined here; however, the illustrated female (NMNZ CR.022686, Fig. 117J–L) has only slightly expanded flexor margins on all walking legs and the male (NMNZ CR.022693, Fig. 117M–O) has a distinctly expanded P2 propodus and progressively straighter margins on P3–4.

Uroptychus megistos most closely resembles *U. paracrassior* Ahyong & Poore, 2004, described from Queensland (364–380 m), in the shape and armature of the carapace, inflated propodal flexor margin of P2 and distal spines along the dactylar flexor margin being about subequal in size. *Uroptychus paracrassior* differs from *U. megistos* in lacking submedian spines along the anterior margin of thoracic sternite 3 (present in *U. paracrassior*), the dactylar margin of P2–4 bears six or seven sharp inclined spines (9–11 spines in *U. paracrassior*), the anterior portion of the pterygostomian flap bears a sharp spine only (dorsally flanked by two spines in *U. paracrassior*) and the antennal article 2 bears at most a small lateral spine (strong spine in *U. paracrassior*).

In the New Zealand region, *U. megistos* may be confused with *U. ritchie* **sp. nov.** and *U. macquariae*; differences are discussed under those species. *Uroptychus duplex* Baba, 2018 also shares the overall carapace shape and the inflated P2–4 propodal margins. However, the anterior margin of thoracic sternite 4 is deeply concave in *U. megistos* (very shallow emarginated with an obsolescent median notch in *U. duplex*), the antennal articles 4 and 5 each bear a distolateral spine (unarmed in *U. duplex*), and the dactylar flexor margins of the walking legs bear fewer spines (six or seven compared to 11–13 in *U. duplex*).

The male (NMNZ CR.022693) bears a multitude of akentrogonid rhizocephalan externae on the proximal portions of the pereopods.

DNA sequence data. Closest interspecific sequence divergences for partial CO1 gene: 11.1% (*U. insignis*), 11.6% (*U. torrancei* **sp. nov.**), 11.8% (*U. longvae*), 12% (*U. macquariae*).

Figure 119. Live coloration of *Uroptychus multispinosus* Ahyong & Poore, 2004, NMNZ CR.025235.

Uroptychus multispinosus Ahyong & Poore, 2004

Figs 119–122

Uroptychus multispinosus Ahyong & Poore, 2004: 60, fig. 17; Baba 2005: 228 (synonymies, key); Baba *et al.* 2008: 37 (list and synonymies); Schnabel 2009b: 29 (list); Webber *et al.* 2010: 225 (list); Baba 2018: 326, figs 157,158.

Type & locality (not examined). Holotype—AM P31415, Stn K78-09-06, 27°55–58′S, 153°55′E, E of Southport, Queensland, 318 m, female (cl 5.2 mm).

Material examined. *North Norfolk Ridge (Australian EEZ)*: NMNZ CR.025235, NORFANZ Stn TAN0308/29, 28°51.24–50.82′S, 167°42.54–41.90′E, 690–812 m, 15 May 2003, 1 female (4.5 mm, pcl 3.0 mm).

Distribution. Queensland, 318–364 m (Ahyong & Poore 2004); Norfolk Ridge, 650 m (Baba 2018); off Norfolk Island, 690–812 m (Fig. 122).

Habitat. Unknown.

Diagnosis. Carapace dorsally unarmed; lateral margin with 5–7 small to obsolescent spines. Lateral orbital spine subequal in size to anterolateral spine. Rostrum narrow (width <0.5 × distance between anterolateral spines), with subapical spines. Sternite 3 anterior margin with median notch, submedian spines obsolescent. Antennal article 2 with distinct outer spine; articles 4 and 5 each with distal spine; antennal scale extending well beyond apex of article 5. Cheliped ischium with strong dorsal spine, ventromesially unarmed. P2–4 propodi with 5–7 spines along flexor margin in addition to distal pair; dactyli distally narrowing (not truncate), with 6–7 loosely arranged, obliquely directed, proximally diminishing spines; penultimate spine larger than ultimate, subequal width to proximal spines 3–5.

Colour in life. Nearly transparent base colour, median longitudinal band of red chromatophores along carapace and abdomen. Faint bands of red pigmentation along epigastric and cervical regions, along lateral margin of ocular peduncle and faint indication of transverse bands on cheliped (one across fingers, two on palm, carpus and merus each), P4 lightly pigmented, P2–3 transparent white (Fig. 119).

Remarks. One female was collected from a small undersea feature 28 km northwest of Norfolk Island during the 2003 NORFANZ voyage and is assigned to *U. multispinosus* Ahyong & Poore, 2004 (the holotype figure is reproduced in Fig. 121). The rostrum of the specimen has two small distal spines on the left margin, instead of a single subapical spine (Fig. 120A), and the carapace bears a minute tubercle dorsomesial to the first lateral branchial spine. The latter has been noted as a diagnostic character for *U. vicinus* Baba, 2018, but this specimen matches the description of *U. multispinosus* in all other aspects.

Baba (2018) reports one male specimen of *U. multispinosus* from Norfolk Ridge and describes a new species, *U. vicinus*, for 20 specimens collected from around the tropical southwest Pacific. The distinction between these two species is based on the relative position and distance between the lateral orbital spine and the anterolateral spine (the anterolateral spine is distinctly posterior and separated by its basal breadth from the lateral orbital spine in *U. multispinosus*, and

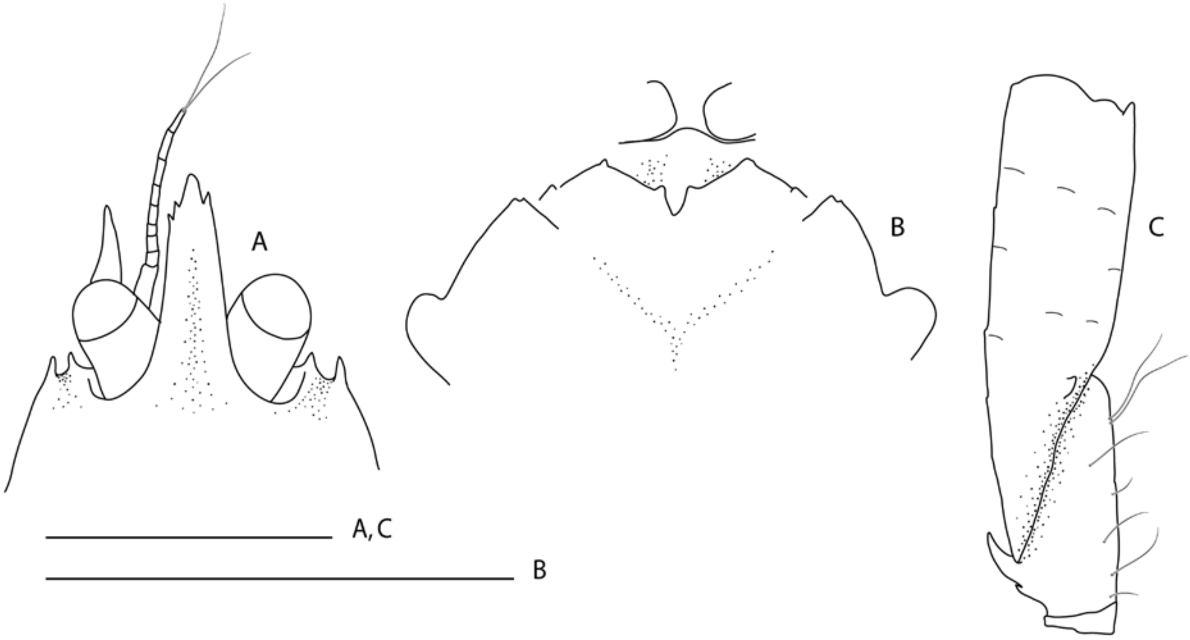


Figure 120. *Uroptychus multispinosus* Ahyong & Poore, 2004, female, NMNZ CR.025235. **A.** anterior portion of carapace showing the left antenna; **B.** excavated sternum and anterior portion of sternal plastron; **C.** cheliped proximal articles, left, mesial. Scale = 2 mm.

directly lateral and contiguous at its base in *U. vicinus*), the size of the lateral carapace spines (distinct in *U. vicinus* and small or obsolescent in *U. multispinosus*), and the presence of and additional spine dorsomesial to the second lateral carapace spine in *U. vicinus* (absent in *U. multispinosus*). These diagnostic characters are slight and an examination of the validity of this new species using molecular techniques will be useful in the future.

In New Zealand, this species may most closely resemble *U. palmaris* Baba, 2018 and *U. spinosior* Baba, 2018. Both are similarly small species that bear subapical spines on the rostrum, an antennal scale overreaching the peduncle, the antennal articles 4 and 5 each with a distal spine, and small lateral carapace spines. *Uroptychus multispinosus* differs from both in having the anterolateral spine subequal in size to the lateral orbital spine, and both spines terminating at about the same level, while in both other species the anterolateral spines are distinctly larger and clearly overreach the lateral orbital spine. *Uroptychus multispinosus* further differs from *U. palmaris* in the spination of the cheliped (*U. palmaris* has distinct dorsal and distodorsal spines on the merus), of the P2–4 dactylar flexor margin (*U. palmaris* has 9–10 spines while *U. multispinosus* has 6–7), and the sternite 3 (with distinct median notch in *U. multispinosus* while *U. palmaris* has two small contiguous submedian spines without notch). *Uroptychus multispinosus* differs from *U. spinosior* in the lateral carapace margin which bears 5–7 lateral spines instead of 12–18, the cheliped ischium is unarmed ventrodistally (Fig. 120C, with a distinct spine in *U. spinosior*), and the P2–4 propodi bear 4–6 spines in addition to the distal pair (only the distal pair at most preceded by one spine on P2 in *U. spinosior*).

Uroptychus multispinosus is aligned with *U. baeomma* Baba, 2018 in the key, based on shared characteristics of the smooth dorsal carapace and spinose lateral margin, P2–4 dactylar spination and a row of spines along the flexor margins of the propodi. However, these two species look very different; *U. multispinosus* has a carapace that is slightly longer than or as long as broad, with a row of small spines along the lateral margin, the anterolateral spine subequal in size to and reaching the tip of the lateral orbital spine and the rostrum furnished with subapical spines. *Uroptychus baeomma* has a carapace wider than long, with the lateral margin distinctly convex, bearing 4 or 5 large branchial spines, a prominent anterolateral spine overreaching the lateral orbital spine, and the entirely smooth rostrum.

Uroptychus nieli sp. nov. Figs 123, 124

Uroptychus flindersi, Schnabel 2009b: 27 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list). [Not *U. flindersi* Ahyong & Poore, 2004]

Material examined. Holotype NIWA 106414, NIRVANA Stn TAN1213/22, 30°4.98–4.97′S, 179°49.33–49.63′E, Colville Ridge, 483–530 m, 18 Oct 2012,

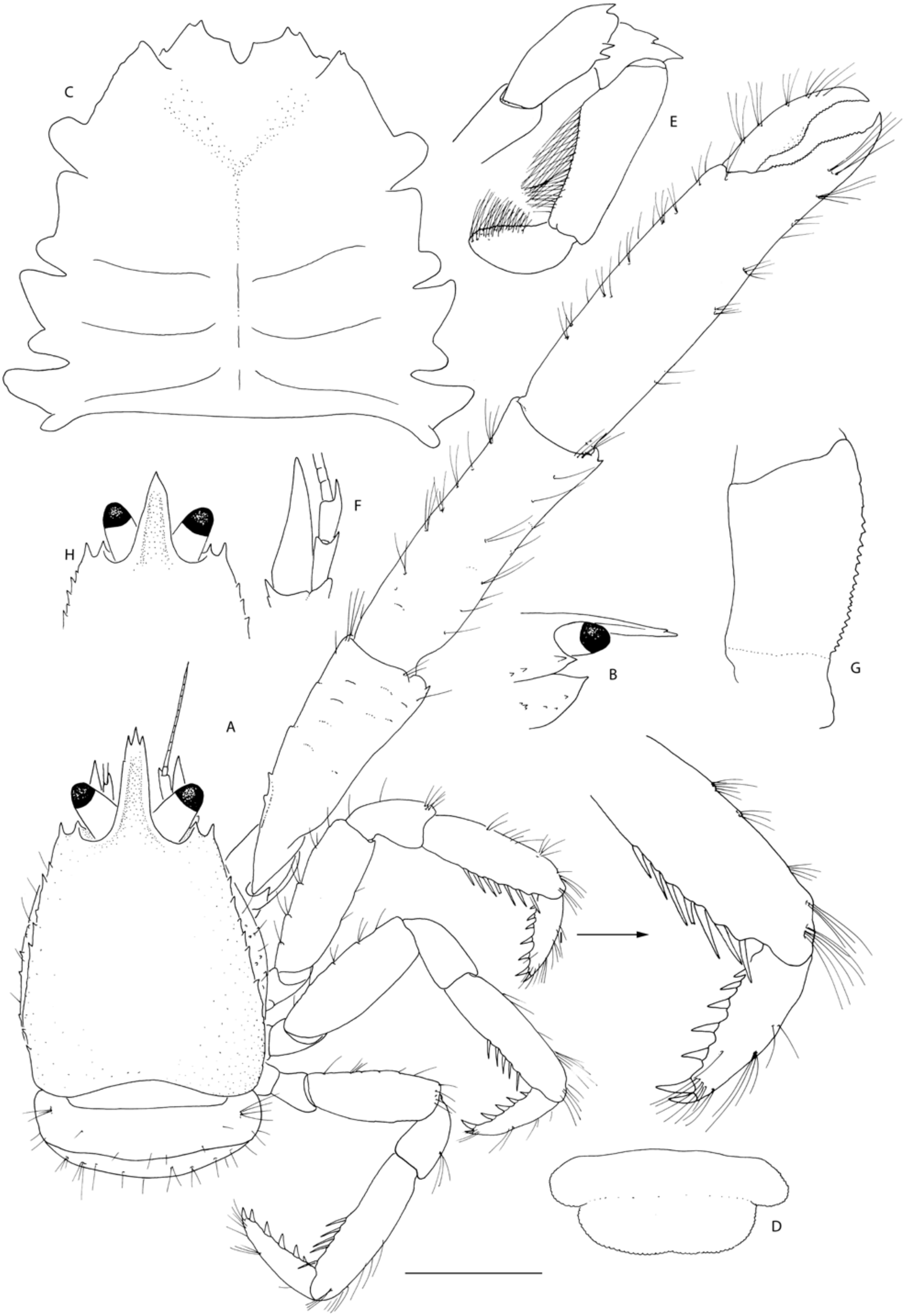
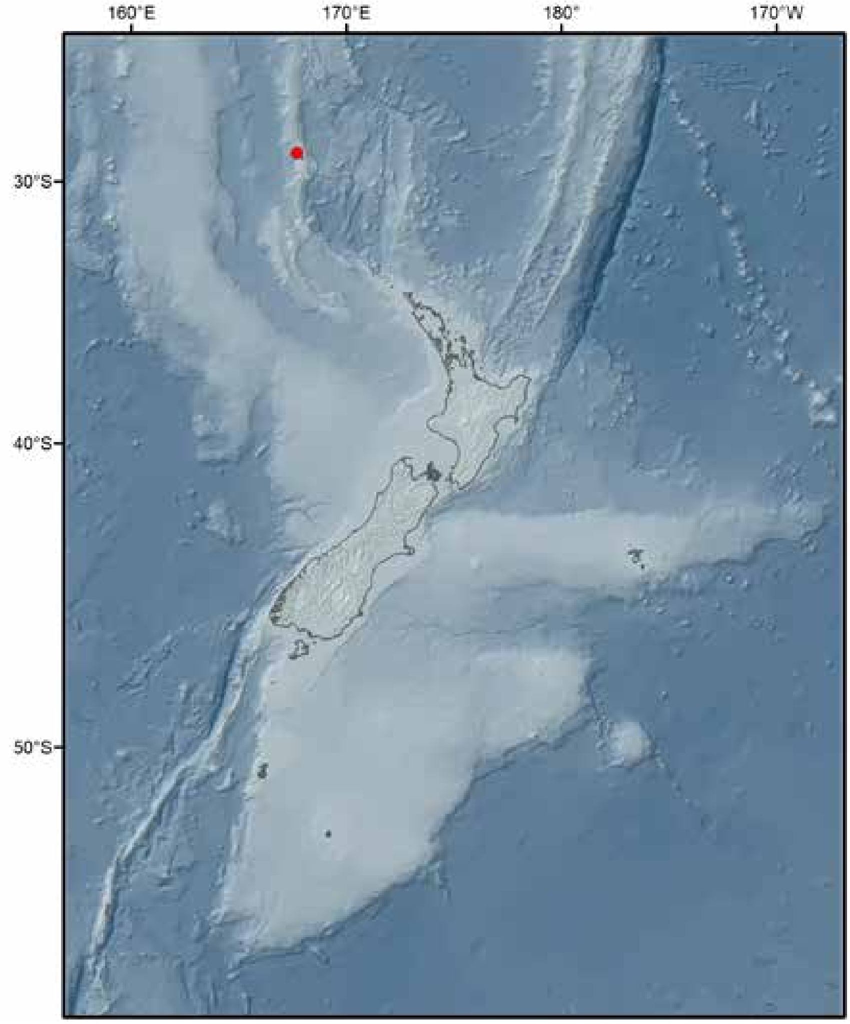


Figure 121. *Uroptychus multispinosus* Ahyong & Poore, 2004, A–G, holotype female, cl 5.2 mm, AM P31415; H, paratype female, 4.6 mm, AM P31414: **A.** dorsal habitus. **B.** anterior carapace, right lateral; **C.** sternum; **D.** telson; **E.** Mxp3, right lateral; **F.** antenna, right ventral; **G.** crista dentata, right; **H.** anterior, dorsal. A–B, H = 2 mm, C–F = 1 mm, G = 0.5 mm. After Ahyong & Poore (2004).

Figure 122. Distribution of *Uroptychus multispinosus* Ahyong & Poore, 2004 around New Zealand.



female ov. (10.0 mm, pcl 6.8 mm; sequenced, see Fig. 5). **Paratypes** *West Norfolk Ridge*: NMNZ CR.022698, NORFANZ Stn TAN0308/154 #77, 34°37.20′S, 168°57.03′E, 521–539 mm, 03 Jun 2003, 2 males (10.9, 9.4 mm, pcl 7.1, 6.1 mm; smaller male sequenced, see Fig. 5); NMNZ CR.022699, NORFANZ Stn TAN0308/154 #25, 34°37.20′S, 168°57.03′E, 521–539 mm, 03 Jun 2003, 1 female ov. (10.0 mm, pcl 6.6 mm), 1 male (7.2 mm, pcl 4.6 mm).

Other material. *Cavalli Seamount*: NIWA 3614, NIWA Stn KAH0204/21, 34°4.32′S, 174°4.08′E, 560–630 m, 16 Apr 2002, 1 male (7.1 mm, pcl 4.5 mm).

Northland Plateau: NMNZ CR.025236, NZOI Stn E850, 33°49.00′S, 171°19.00′E, 509–515 m, 17 Mar 1968, 1 female (7.6 mm, pcl 4.9 mm).

Type locality. Colville Ridge, 483–530 m.

Distribution. West Norfolk Ridge, Northland Plateau, and Colville Ridge, 483–630 m (Fig. 124).

Habitat. Unknown.

Diagnosis. Carapace dorsally unarmed, slightly longer than broad (without rostrum); lateral margin subparallel, with large simple, bifid or trifid anterior branchial spine followed by regular row of small spines or granules. Rostrum narrow triangular (width less than half distance between anterolateral spines). Thoracic sternite 3 anterior margin medially deeply excavated with median notch and submedian spines; sternite 4 anterolateral margin distinctly longer (> 2 ×) than posterolateral margin; sternite 5 anterolateral margin distinctly convex. Ocular peduncle about twice as long as wide; cornea slightly inflated. Antennal article 4 much shorter than article 5, unarmed; article 5 with small distal spine. Cheliped ischium with strong dorsal and small ventromesial subterminal spine; merus and carpus with ventral field of rugosities or denticles; merus distoventrally with stout spine. P2–4 meri successively shortening, with ventrodistal spine, relatively broad, length-breadth ratio 2.5–3.7; P2 merus 0.7 × pcl; P2 carpus longest, P2–3 carpi equal in length; propodi with 5–9 spines along flexor margin, in addition to distal pair; dactyli distally narrowing; with 8–10 oblique, sharp triangular spines regularly arranged along flexor margin, distal spines subequal in size.

Description. Carapace: pcl 1.1 × width. Dorsal surface smooth and unarmed; cervical groove not deep but distinct. Lateral orbital spine slightly smaller than and slightly overreaching anterolateral spine. Anterolateral spine well-developed; lateral margins subparallel, with prominent simple, bifid or trifid

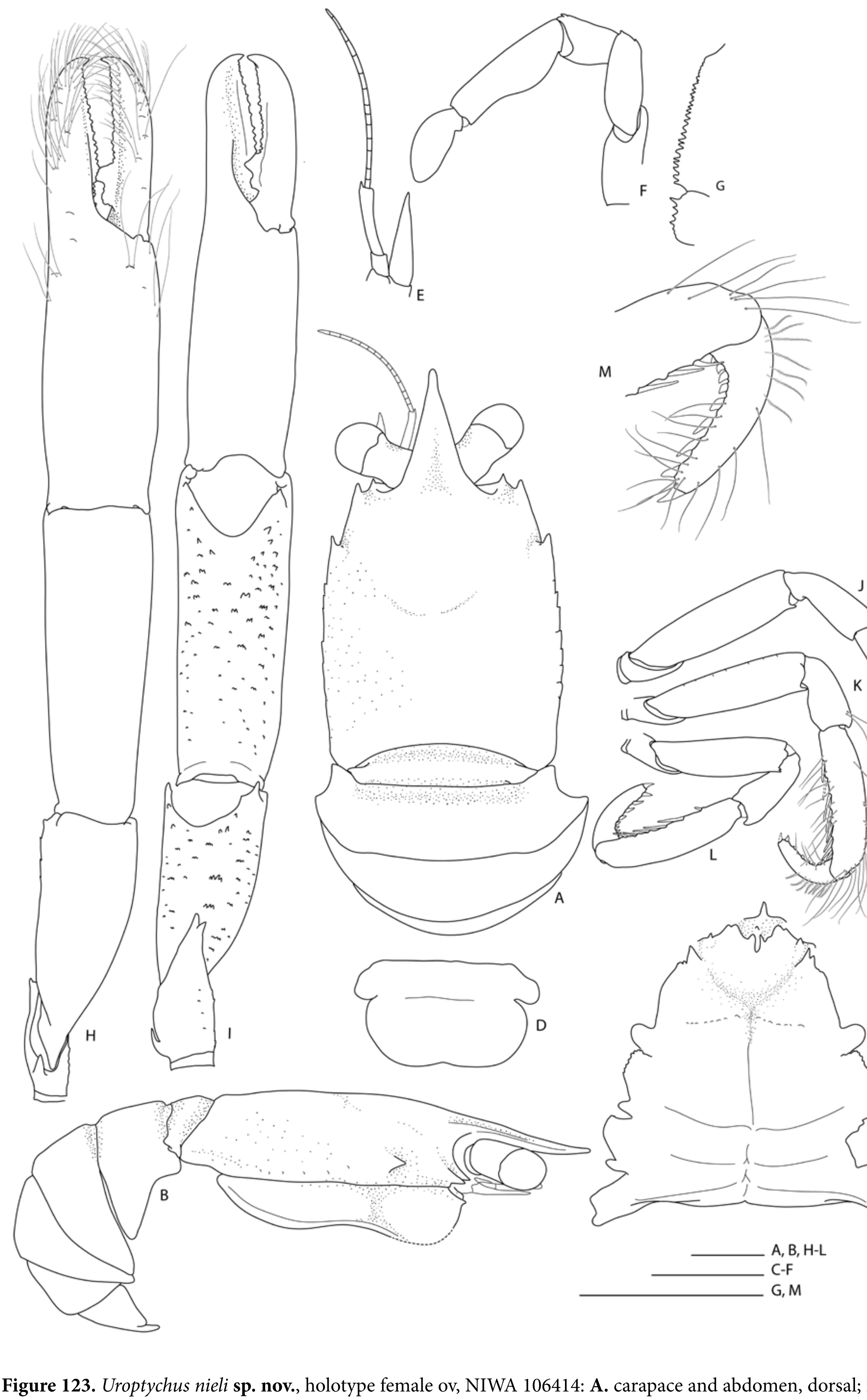


Figure 123. *Uroptychus nieli* **sp. nov.**, holotype female ov, NIWA 106414: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left Mxp3; **H.** left cheliped, dorsal; **I.** right cheliped, ventral; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus of right P4. Scale bars = 2 mm.

spine at anterior branchial margin, followed by regular serration or indistinct spines along posterior branchial margin; hepatic region unarmed; posterolateral corner rounded, without distinct ridge. Rostrum [0.5]–0.6 × pcl, narrow triangular (width < 0.5 × distance between anterolateral spines), horizontal; 1.4 × longer than wide at base; dorsal surface excavated; lateral margins smooth. Pterygostomian flap surface smooth; anterior margin rounded with small spine.

Thoracic sternum: Excavated sternum with sharp anterior spine and small spine on midline. Sternal plastron 1.3 × as wide as long, widening posteriorly; surface smooth. Sternite 3 anterior margin deeply excavated, produced anteriorly; median notch present with submedian spines; lateral corners produced to spine. Sternite 4 anterior margin deeply concave; anterolateral margin produced to tooth followed by few spines proximally, > 2 × longer than posterolateral margin; laterally unarmed. Sternite 5 anterolateral margin distinctly convex, irregular.

Abdomen: Tergites smooth and unarmed. Tergite 1 with low ridge at posterior margin; tergites 2–4 without transverse ridges or grooves. Pleural margins of somites 2–4 distally tapering. Telson 1.8 × as broad as long; posterior margin emarginated; posterior portion 1.9 × length of anterior portion.

Eyes: Smooth, about twice as long as wide; mesial margin concave. Cornea subglobular, slightly inflated, 0.3–[0.4] × length of ocular peduncle.

Antennal peduncle: Article 2 with indistinct lateral spine. Article 3 unarmed. Article 4 unarmed distally; mesial margin unarmed. Article 5 armed with small distomedian spine; mesial margin unarmed; 3 × as long as article 4. Antennal scale reaching the midlength to [nearly reaching end of article 5]; 4 × as long as wide.

Maxilliped 3: Coxa unarmed. Basis with multiple distinct denticles along mesial ridge. Merus and ischium with surface smooth, ischium without distal spines; crista dentata with about 20 denticles, progressively diminishing in size distally. Merus extensor margin with small distal spine; flexor margin without spine. Carpus with small distal spine on extensor margin. Remaining articles unarmed.

Cheliped: Stout; 4 × pcl; surfaces smooth except ventral and mesial surfaces of merus and carpus with denticles. Ischium with dorsal and ventral spines distally. Merus, with 1 or 2 distoventral spines (mesial spine typically distinct). Carpus with two distoventral spines distinct or indistinct; length 1.1–1.2 × that of palm. Palm 2–2.3 [2.2–2.3] × as long as wide, unarmed. Dactylus 0.6–[0.7] × as long as propodus; occlusal margins denticulate, without gape.

Pereopods 2–4: Similar; surface slightly setose. Merus dorsal and ventral margins unarmed other than distoventral spine; shortest merus on P4, P4 merus 0.7–0.8 × as long as P2 merus, P3 merus 0.8–[0.9] × as long as P2 merus; P2 merus 2.5–3.7 [3.5] × as long as wide; merus-propodus length ratio 1.0–[1.1] (P2), 0.9–[1.0] (P3), 0.8–[0.9] (P4). Carpus dorsal margin unarmed, with or without a small distal spine, otherwise unarmed. Propodus 4.3–4.8 × longer than wide; extensor margin smooth; flexor margin nearly straight, with 5–9 spines in addition to distally paired spines along distal 0.7–0.8 portion; about 2 × as long as dactylus. Dactylus curved; flexor margin with 9–10 sharp inclined, proximally diminishing spines along entire length, ultimate spine subequal in size to penultimate and antepenultimate.

Ovum. Diameter 1.3 × 1.4 to 1.9 × 1.5 mm. The holotype has 12 eggs.

Colour in life. Unknown.

Etymology. Named after Niel Bruce, formerly of NIWA and the Tropical Museum of Queensland, Townsville: with thanks for his academic mentoring and friendship.

Remarks. *Uroptychus nieli* **sp. nov.** is similar to *U. flindersi* Ahyong & Poore, 2004, *U. sibogae* van Dam, 1933 and *U. nebulosus* Baba, 2018 but consistent morphological differences and interspecific levels of genetic divergence warrant recognition as a new species.

Only limited variation was observed in the type series of *U. nieli*, including the shape of the prominent anterior branchial spine on the lateral carapace margin. The larger male from TAN0308 Stn 154 (NMNZ CR.022698) has a bifid and trifid set of spines, similar to *U. flindersi*, but the remaining specimens have a simple strong spine and there may or may not be one or more small spines or granules present mesially. In *U. flindersi*, this spine is always bifid (Ahyong & Poore 2004). The cheliped merus distolateral margin is either furnished with a distinct or just a small spine (as in the holotype, Fig. 123I) and the P2–4 carpi may or may not have a small distodorsal spine. Otherwise, the specimens agree in all other characters.

Morphological differences in *U. nieli* **sp. nov.** are slight, e.g. *U. nieli* **sp. nov.** aligns with *U. flindersi* in that the carapace proportions are slightly longer, the lateral branchial carapace margins are sub-parallel, and the cheliped ischium has a small ventral subterminal spine; both *U. nebulosus* and *U. sibogae* have a carapace that is as long as broad, distinctly convex branchial carapace margins and the ventrally unarmed cheliped ischium. Also, *U. nieli* **sp. nov.** aligns with *U. sibogae* in that the cornea is distinctly inflated, while it is

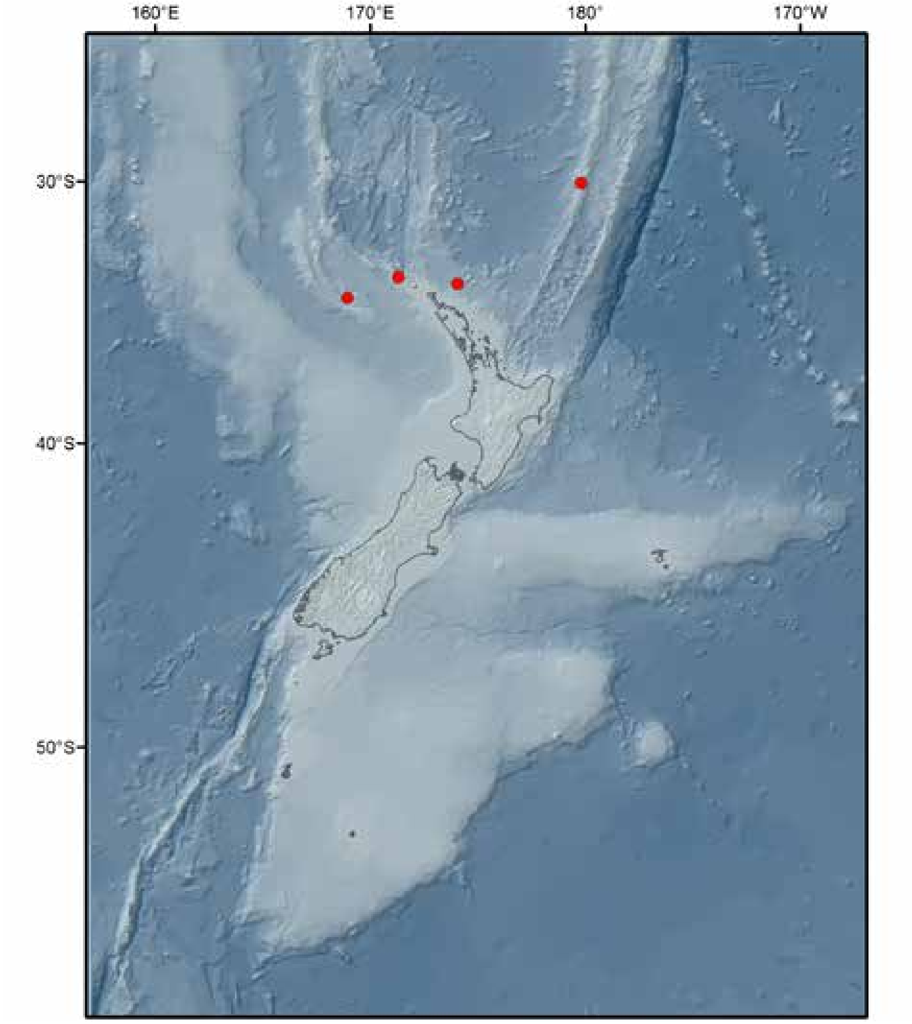


Figure 124. Distribution of *Uroptychus nieli* **sp. nov.** around New Zealand.

either not (*U. flindersi*) or only slightly inflated (*U. nebulosus*). Both the pterygostomian flap and the basal antennal article are more similar to those of *U. nebulosus* and *U. sibogae*, the former having a small anterior spine and the latter having a nearly indistinct lateral spine. In *U. flindersi*, both the spines on the pterygostomian flap and the antennal article 2 are distinct. Conversely, in *U. nebulosus* the Mxp3 merus is unarmed and the P2–4 merus is not furnished with a distinct ventrodistal spine, but both of these spines are always present in *U. nieli* **sp. nov.** (and *U. flindersi*). The cheliped is around 4 × pcl in *U. nieli* **sp. nov.** while it is nearly 5 × in all the others. It is notable that the ventral surfaces of the cheliped meri and carpi are tuberculate in all these species, but it appears that the degree of ornamentation is most pronounced in *U. nieli* **sp. nov.**, with the surfaces entirely covered with sharp denticles. Baba (2018) proposed meristics of the walking legs as diagnostic characters, e.g. the length-breadth ratio of the P2 meri, 3.7–3.9 in *U. nebulosus*, 5.0–5.6 in *U. sibogae,* and 4.4 in *U. flindersi* (based on illustration of the holotype) and the ratio is much stouter, 2.5–3.7 [3.5], in *U. nieli* **sp. nov.** Also, the relative length of the P2 merus compared to the pcl is 0.8 in both *U. nebulosus* and *U. flindersi*, and subequal in *U. sibogae* but 0.7 in all specimens examined for *U. nieli* **sp. nov.** Hence, *U. nieli* **sp. nov.** walking legs are, in general, stouter compared to its close relatives (Fig. 123J–L). Finally, the number of spines along the P2–4 propodi (five to nine) in *U. nieli* **sp. nov.** differs from those of *U. nebulosus* and *U. flindersi* (9–11) and the number of spines along the flexor margins of the dactyli (9–10 in *U. nieli* **sp. nov.**) is less than the 10–12 reported for *U. nebulosus*.

Uroptychus flindersi is so far known from localities between Tasmania and Western Australia; both *U. sibogae* and *U. nebulosus* are widely distributed in the tropical western Pacific; and *U. nieli* **sp. nov.** is restricted to the ridges just north of New Zealand, between around 30–34°S.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.8% (two specimens). Closest interspecific sequence divergences for partial CO1 gene: 7.0–7.2% (*U. flindersi* tissue kindly donated by Shane Ahyong (AM) from a specimen collected from the Great Australian Bight (NMV specimen collected at station IN2015_C02_174).

ZooBank registration. *Uroptychus nieli* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:25398CA4-D2B2-4C79-9BE2-463C7018F5D7.

Figure 125. Live coloration of *Uroptychus nigricapillis* Alcock, 1901: **A.** NIWA 82396, Stn TAN1206/46; **B.** NIWA 127238, RV *Sonne* Stn SO254_84ROV18. Image in A courtesy of Rob Sewart, NIWA. Image in B captured by Peter Schupp onboard RV *Sonne* (voyage SO254), courtesy of Project PoriBacNewZ, GEOMAR & ICBM.

Uroptychus nigricapillis Alcock, 1901

Figs 125–128

Uroptychus nigricapillis Alcock, 1901: 283, pl. 3: fig. 3; Alcock & McArdle 1902: pl. 56: fig. 3; van Dam l933: 26; 1940: 98, fig. 2; Baba 1981: 116, fig. 4; 1988: 40; 1990: 947 (part); Baba 2005: 50 (part); Baba *et al*. 2008: 37; 2009: 50 (part), figs 41–43; Schnabel 2009b: 578 (part); Poore *et al*. 2011: 329, pl. 7, figs E, F; Baba 2018: 341, figs 162–173.

Uroptychus gracilimanus, Ahyong & Poore 2004: 40, fig. 10 (not *U. gracilimanus* Alcock, 1901).

Uroptychus sp., Schnabel, 2009a: 578 (part).

Not *Uroptychus nigricapillis*, Laurie 1926: 123 (= *U. longioculus* Baba, 1990).

Not *Uroptychus nigricapillis*, Tirmizi 1964: 390, figs 4, 5; Baba 2005: 50 (part) (= new species).

Not *Uroptychus nigricapillis*, Ahyong & Baba 2004: 60, fig. 2 (= *U. michaeli* Ahyong & Baba, 2017).

Type & locality (not examined). Holotype—ZSIC 3443/10, Andaman Sea, 669 fms (1224 m), female.

Material examined. *Kermadec Ridge*, *Havre Volcano*: NIWA 18579, NIWA Stn TAN0205/48, 31°05.25′S, 179°05.40′W, 1129 m, 19 Apr 2002, 1 female (7.5 mm); NIWA 24585, NIWA Stn TAN1213/39, 31°06.25–06.11′S, 179°05.97–05.97′W, 1022–1034 m, 20 Oct 2012, 1 female (12.2 mm, pcl 8.7 mm; sequenced, see Fig. 5).

Southern Colville Ridge, *Mercury Knoll*: NIWA 76188, NIWA Stn KAH9907/51, Z9843, 36°30.37–29.59′S, 176°30.97–30.97′E, 920–1053 m, 05 Jun 1999, 1 male (9.6 mm, pcl 6.7 mm).

Raoul Island, *Kermadec Islands*: Multiple specimens reported as NMNZ CR.012099 in Schnabel (2009), Stn BS312, 28°25′S, 177°50′E, 1189–1225 m, 5 Apr 1973: CR.023690, female ov. (12.8 mm, pcl 9.0 mm), CR.023693 (12.8 mm, pcl 9.0 mm), CR.023700, 1 female ov. (13.6 mm, pcl 9.5 mm), CR.023704, 1 female (11.8 mm, pcl 8.5 mm). Preserved with fragments of gold coral.

Bay of Plenty: NIWA 18578, Stn Z9219, 1124/58, 37°04.06′S, 176°42.05′E, 1011 m, 06 Aug 1998, 1 female (9.2 mm, pcl 6.6 mm); NIWA 83478, NIWA Stn TAN1206/179, 37°19.02–19.02′S, 178°01.77–0.150′E, 1186-1196 m, 01 May 2012, 1 female (11.2 mm, pcl 7.9 mm); NIWA 23373, Stn F873, 37°19.5′S, 178°11.0′E, 1050 m, 03 Oct 1968, 1 male (9.9 mm, pcl 6.7 mm); NIWA 82396, NIWA Stn TAN1206/46, 37°22.05–22.05′S, 177°38.05–37.54′E, 1191–1194 m, 19 Apr 2012, 1 male (12.5 mm, pcl 8.8 mm; sequenced, see Fig. 5); NMNZ CR.012100, NZOI Stn F897, 36°40.49′S, 176°23.99′E, 1306–1141 m, 6 Oct 1968, 1 male (6.6 mm, pcl 4.9 mm); NMNZ CR.012102, NZOI Stn F879, 37°25.49′S, 177°30.00′E, 1267–1174 m, 4 Oct 1968, 1 male (6.7 mm, pcl 4.6 mm); NMNZ CR.012103, NZOI Stn F878, 37°28.49′S, 177°31.49′E, 997–942 m, 3 Oct 1968, 1 male (9.4 mm, pcl 6.2 mm); NMNZ CR.015264, NZOI Stn R120, 37°29.00–30.6′S, 177°32.00–32.4′E, 818–898 m, 24 Apr 1979, 4 females ov. (10.7, 10.5, 9.5, 9.5 mm, pcl 7.7, 7.8, 6.8, 6.7 mm),

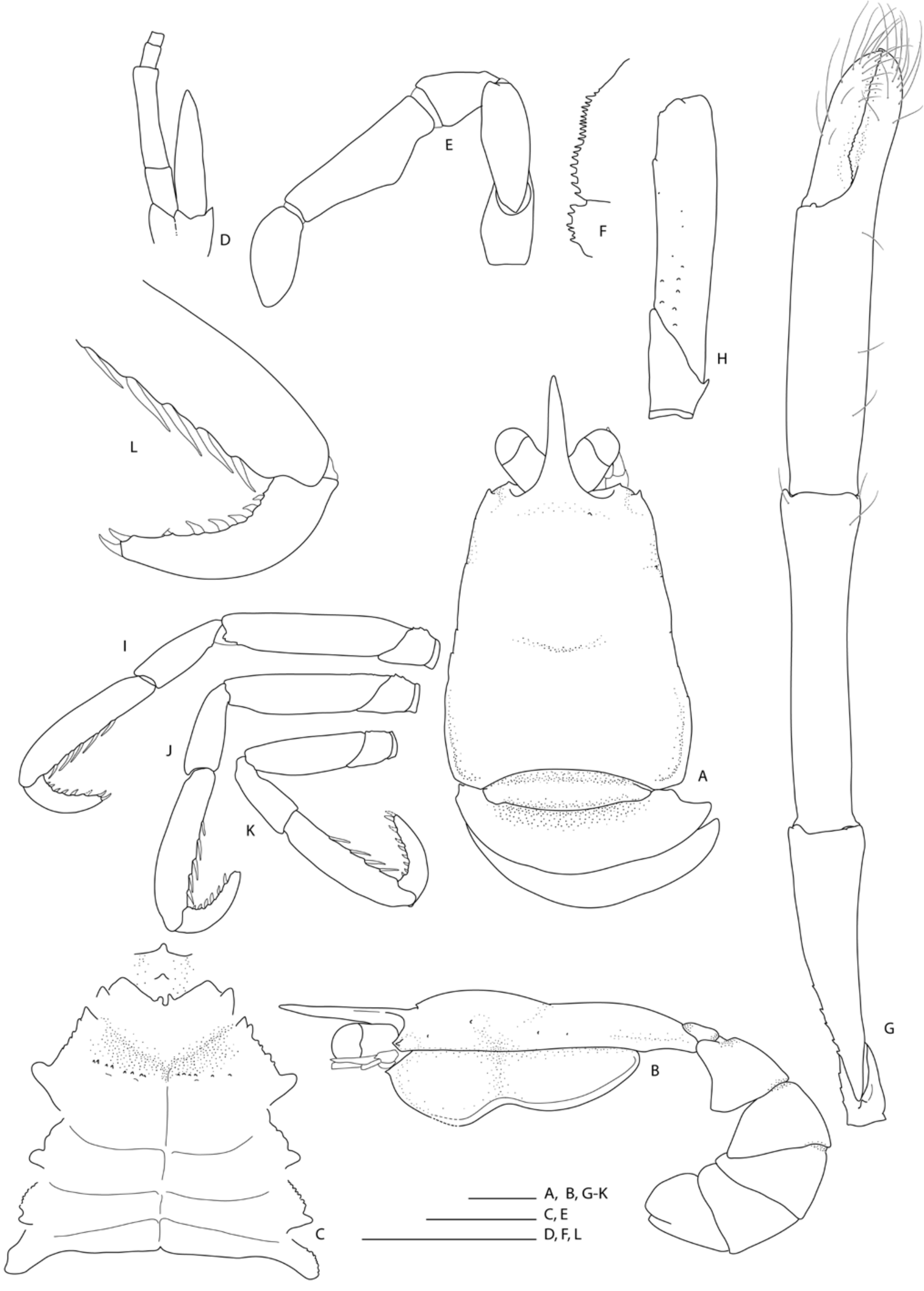


Figure 126. *Uroptychus nigricapillis* Alcock, 1901, female, NIWA 83478: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** antenna, left, ventral; **E.** endopod of Mxp3, left, lateral; **F.** crista dentata of left Mxp3; **G.** right cheliped, dorsal; **H.** right cheliped ischiomerus, mesial; **I–K.** left P2–4; **L.** distal propodus and dactylus of left P2. Scale bars = 2 mm.

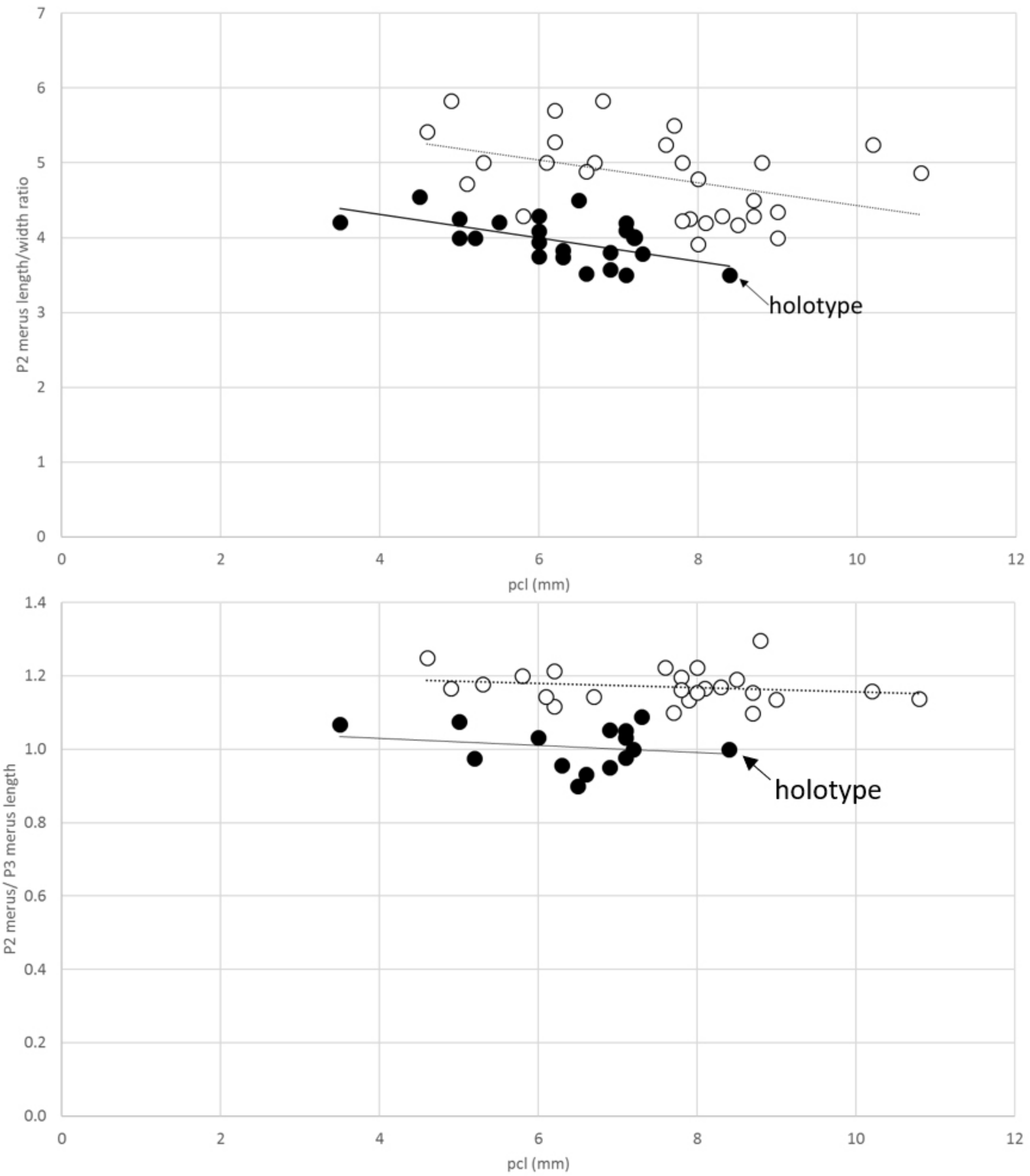


Figure 127. Comparative meristics for New Zealand *Uroptychus nigricapillis* (white circles) and *U. terminalis* (black circles); the top shows the postorbital carapace length (pcl) against the length-width ratio of the merus of the first walking leg (P2) and the bottom shows the postorbital carapace length (pcl) against P2 merus/P3 merus length ratio. The measurements of the holotype of *U. terminalis* from Norfolk Ridge have also been included.

3 females (11.3, 10.8, 9.1 mm, pcl 8.0, 7.6, 6.2 mm), 1 male (8.3 mm, 5.8 mm), on *Acanella*.

Hikurangi Margin, *Seamount 1247*, *off East Cape*: NIWA 127238, RV *Sonne* Stn SO254_84ROV18, 37°54.80′S, 179°12.81′E, 1302.1, 23 Feb 2017, 1 female ov. 14.2 mm, pcl 10.2 mm), 1 male (14.2 mm, pcl 10.8 mm), on *Acanella*, collected by GEOMAR ROV *KIEL 6000*, onboard RV *Sonne*, ICBM expedition SO254; NMNZ CR.012104, NZOI Stn D836, 37°34.00 S, 179°22.00′E, 1395 m, 6 Mar 1969, 2 males (7.9, 7.5 mm, pcl 5.3, 5.1 mm), 1 female ov. (9.7 mm, pcl 6.6 mm.

No location information. NMNZ CR.012105, NMNZ BS 353, 1 female ov. (12.2 mm, pcl 8.7 mm).

Distribution. Western Indian Ocean (Mozambique Channel, Zanzibar, off Kenya, South Arabian coast, Madagascar and Maldives), Andaman Sea, west of Makassar, Java Sea, Flores Sea off southern Sulawesi, between Siquijor and Bohol, South China Sea, Taiwan, and Japan (southeastern Kyushu), 450–1939 m (van Dam's (1940) record in 66 m in the Java Sea is considered dubious); Solomon Islands, Wallis and Futuna Islands, Vanuatu, Chesterfield Islands and New Caledonia, in 399–1220 m (Baba 2018); Kermadec Ridge and Bay of Plenty and northern Hikurangi margin, 818–1395 m (Fig. 128).

Habitat. This species is typically collected together

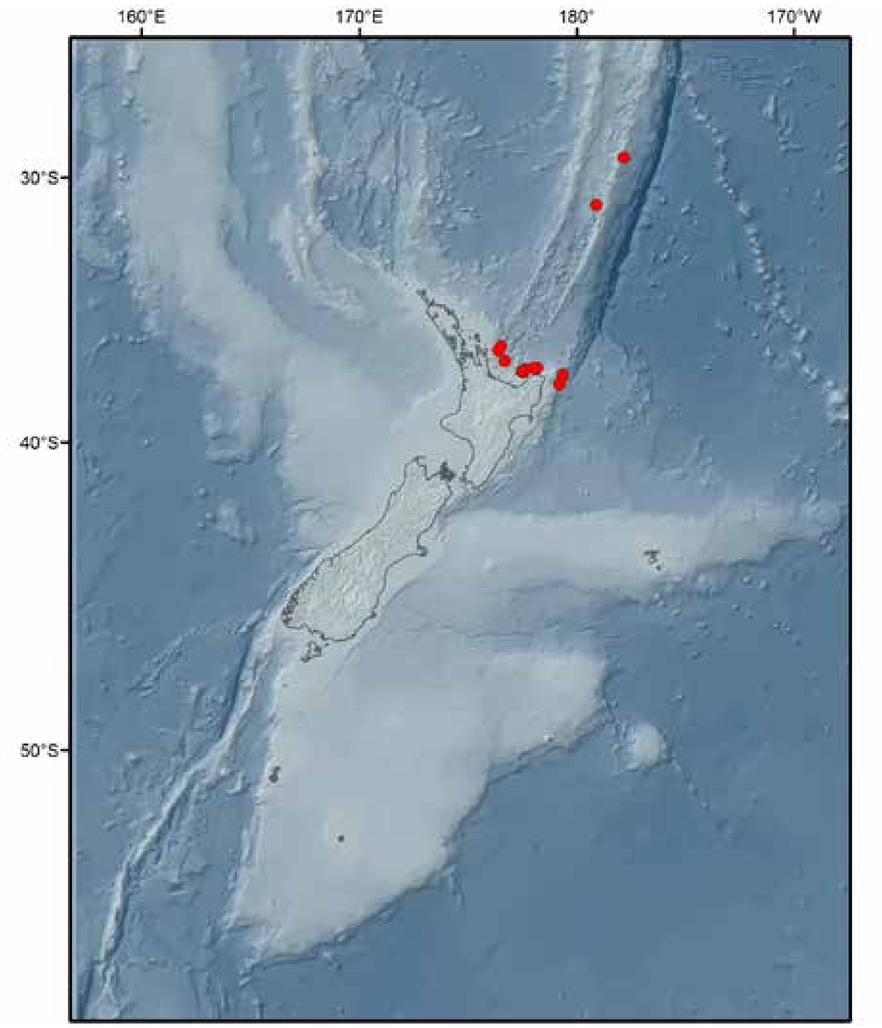


Figure 128. Distribution of *Uroptychus nigricapillis* Alcock, 1901 around New Zealand.

with octocorals, nearly always with *Acanella* or other small bushy species, and an association is implied. Interestingly, the same colonies appear to be shared with closely related congeners such as *U. terminalis* and *U. australis*.

Diagnosis. pcl 1.1–1.2 × width; dorsally smooth except small to large pair of epigastric spines; lateral margin unarmed; a few tubercles usually present. Rostrum narrow (width < 0.5 × distance between anterolateral spines at base). Ocular peduncle about 1.5 × longer than wide. Sternite 3 deeply excavated anteriorly, with distinct median notch and submedian spines. Cheliped with ischium smooth ventrally (subterminal spine absent). P2–4 relatively slender, P2 merus shorter than pcl, P2 merus 4.3–6.5 × longer than broad; 1.2–1.3 × length of P3 merus. Propodi with row of spines along about distal ¾ of flexor margin, terminal spine single and typically situated distinctly remote from juncture with dactylus, at least on P2; dactyli distally narrowed (not truncate); flexor marginal spines sharp triangular, obliquely directed, arranged loosely and regularly (antepenultimate spine may be situated slightly isolated from distal pair than proximal group); ultimate slightly larger than penultimate and subequal to antepenultimate.

Colour in life. Baba *et al.* (2009) and Poore *et al.* (2011) included photos of live coloration of two specimens from Taiwan as "Pale orange red overall, color sometimes deeper and sometimes paler. Tailfan translucent, eggs white." Their illustrations match the observations for New Zealand specimens (Fig. 125).

Remarks. The present specimens represent the first records of *U. nigricapillis* in the New Zealand region. *Uroptychus nigricapillis* is supposedly a widespread Indo-Pacific species, which may prove to be more than four species pending examination of the type material collected by the *Investigator* from the Andaman Sea and deposited at the Zoological Survey of India, Calcutta (see comments in Baba (2018)). Until then, the New Zealand material is considered as *U. nigricapillis sensu lato* in having a relatively slender and smooth carapace, bearing a small but mostly distinct pair of epigastric spines, and slender and smooth cheliped and walking legs. The distinguishing characteristics are the obliquely arranged sharp triangular spines along the dactylar flexor margins of the walking legs (not contiguous with the flexor margin as in *U. australis* and relatives), the ultimate spine is slightly but distinctly larger and longer than the penultimate (compared to smaller in *U. gracilimanus*) and the arrangement of the spines along the propodal flexor margins of the walking legs with the distalmost spine single (not paired as in e.g. *U. empheres*) and situated distinctly proximal to the juncture with the dactylus (Fig. 126L). The latter is the chief diagnostic character distinguishing *U. nigricapillis* from its most similar relative, *U. terminalis* Baba, 2018. In fact, the material previously reported as *Uroptychus* sp. by Schnabel (2009a) from New Zealand included both of these species in equal proportion.

In the key provided by Baba (2018), *U. nigricapillis* and *U. terminalis* are also separated based on relatively slender and broad walking legs, respectively. The P2 merus of *U. nigricapillis* is reported to be 5.2–6.5 × longer than broad compared to 3.7–4.8 × in *U. terminalis*. Examining the New Zealand material indicates that this relationship generally holds but is not reliable when used alone (see Fig. 127, top). The range for *U. nigricapillis* examined here was 4.2–5.8, which overlapped with the range for *U. terminalis* of 3.5–4.5. It appears that this character may be size-related but the trend lines in Fig. 127 indicate that in nearly all cases, size-matched specimens of *U. nigricapillis* had more slender P2 ratios compared to *U. terminalis*. Additionally, the maximum size of *U. terminalis* appears smaller in comparison, maximum size of New Zealand specimens being 7.3 mm (pcl) in length. The P2 length-width ratio for the large holotype (MNHN-IU-2014-16975, 8.4 mm) has been added in Fig. 127 which still lies below the ratio for *U. nigricapillis* of the same size.

Other characters that appear to be constant and are proposed to distinguish these two species:

- the cheliped ischium is smooth and unarmed distoventrally in *U. nigricapillis* while it always bears a vestigial to small spine in *U. terminalis*;
- the relative length of the P2 merus compared to the P3 merus appears consistently different, with the P2 always being slightly longer (1.1–1.3 × P3) in *U. nigricapillis* and nearly always equal in length or slightly shorter (0.9–1.1 × P3) in *U. terminalis* (Fig. 127, bottom);
- while both species bear the same number of spines along the flexor margins of the P2–4 propodi (e.g. 6–8 on P2), they are distributed differently; in *U. nigricapillis* they are placed along the distal 0.75–0.9 portion, which gives a general impression of being more loosely spaced, compared to the distal ~0.5 portion in *U. terminalis*.

All these proposed differences are slight in this group of smooth and slender *Uroptychus* species and finding new characters will be increasingly required to differentiate between the growing numbers of species being discovered. Notably, *U. nigricapillis* appears to be genetically more like other species than these morphologically similar species *U. terminalis*, *U. empheres* and *U. australis* (see below), and more focused phylogenetic work is required to examine the relationships of these species.

One female from NMNZ CR.015264 bears a large and unusual parasite, possibly an akentrogonid rhizocephalan on the propodus of the third walking leg.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.6% (two specimens, NIWA 24585, 82396). They match a sequence of *U. nigricapillis* listed in Baba (2018) from Vanuatu (MUSORSTOM 8 Stn CP1129, MNHN-IU-2013-12296) with 0.7–1.1% sequence divergence (L. Corbari pers. comm.). Closest interspecific sequence divergences: 7.5–8.1% (*U. fenneri*, USNM ROV 2010 RB 545) and 8.8–9.4% (*U. nitidus*), two Atlantic species, and 8.2–8.2% (*U. litosus*).

Uroptychus nirvana sp. nov. Figs 129, 130

Material examined. Holotype NIWA 106415, NIRVANA Stn TAN1213/22, 30°04.98′S, 179°49.33′E, Colville Ridge, 483–530 m, 18 Oct 2012, female (13.4 mm, pcl 10.4 mm; sequenced, see Fig. 5). **Paratype** *Colville Ridge*: NIWA 123236, collected together with holotype, 1 male (13.7 mm, pcl 9.8 mm; sequenced, see Fig. 5).

Type locality. Colville Ridge, 483–530 m.

Distribution. Known only from type locality (Fig. 130).

Habitat. There is no record of biological associations for *U. nirvana* **sp. nov.** but a number of samples of *Chrysogorgia* gold coral, scleractinian branching hard coral *Enallopsammia rostrata*, large plexaurids and primnoid gorgonians and euplectellid sponges, were collected with the type specimens.

Diagnosis. Carapace slightly broader than or about as long as broad (without rostrum), finely granulated on dorsal surface, unarmed; anterolateral spine distinct, lateral orbital spine absent or minute; remaining lateral margin without spines but finely serrate, with narrow ridge along posterior fifth. Rostrum narrow triangular. Pterygostomian flap lacking distinct spine on anterior margin; granulate on surface. Thoracic sternite 3 anterior margin deeply excavate, with median notch and obsolescent submedian spines. Sternite 4 with anterolateral angle not reaching anterior end of sternite 3; anterolateral margin distinctly longer than posterolateral margin. Sternite 5 with anterolateral margin distinctly convex. Antennal article 4 with short blunt distomesial spine; article 5 with small terminal tubercle; article 2 with small but distinct distolateral spine; antennal scale reaching midlength or nearly

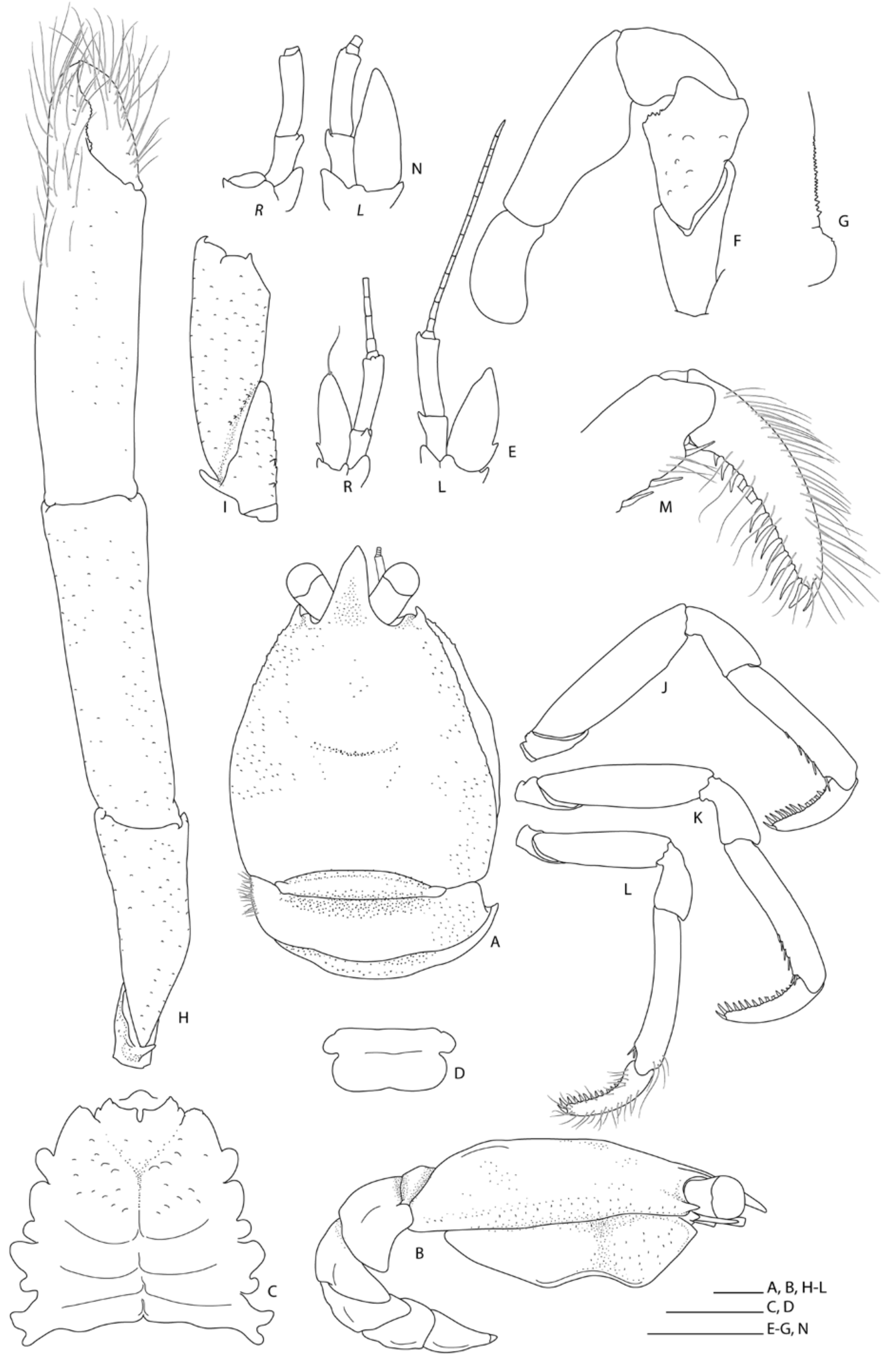


Figure 129. *Uroptychus nirvana* **sp. nov.**, A–M, holotype female, NIWA 106415; N, paratype male, NIWA 123236: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E, N.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of right Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** propodus and dactylus of left P3. Scale bars = 2 mm.

reaching end of article 5. Ocular peduncle 1.8 × as long as wide. Cheliped ischium with distinct dorsal spine, ventrally unarmed (margin may be irregular); surface granulate; merus with row of small spines close to articulation with ischium; palm without distinct ridge along mesial margin. Pereopods 2–4 meri and carpi smooth along dorsal margins; P4 merus 0.7–0.8 × P3 merus in length; carpi subequal in length; propodi without convex flexor margin; with row of 4–7 (P2), 3 or 4 (P3) and 0 (P4) spines along flexor margin, in addition to distal pair; dactyli distally narrowed, length much longer than that of carpi (around 1.5 ×) and around two-thirds length of propodi, flexor margin with 12–14 sharp triangular spines, slightly obliquely arranged and regularly spaced along entire length; distal 3 subequal in size, with fringe of plumose setae on extensor margin.

Description. Carapace: pcl [0.9]–1.0 × width, strongly convex. Dorsal surface finely granulose, unarmed, increasingly granular and tuberculate towards lateral margins; cervical groove indistinct (faintly indicated). Lateral orbit [rounded] or with minute spine. Anterolateral spine well-developed, angled mesially; lateral margin convexly divergent posteriorly and irregular, unarmed. Rostrum [0.3]–0.4 × pcl, narrow triangular (width < 0.5 × distance between anterolateral spines), distinctly deflected ventrally; [1.3]–1.6 × longer than wide at base; dorsally excavated; lateral margins smooth. Pterygostomian flap surface granulate; anterior margin with blunt, angular margin, without spine.

Thoracic sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron 1.2 × as wide as long, slightly widening posteriorly. Sternite 3 anterolaterally angular, anterior margin deeply excavated; with median notch and indistinct submedian spines; lateral corner with small spine; surface smooth. Sternite 4 2.2 × as wide as sternite 3, surface with short rows of setae, anteriorly shallow concave, midline grooved; anterolateral margin rounded, crenulate, longer than posterolateral margin; laterally unarmed. Sternite 5 anterolateral margin rounded, unarmed.

Abdomen: Tergites covered with short, fine setae; without ridges; unarmed. Telson 2.2 × as broad as long; posterior margin nearly straight; posterior portion 1.3–1.6 × length of anterior portion.

Eyes: Smooth, length-width ratio < 2.0. Cornea subglobular, 0.4–0.5 × length of ocular peduncle.

Antennal peduncle: Article 2 with small outer spine. Article 3 unarmed. Article 4 with small but distinct distal spine; mesial margin unarmed. Article 5 armed with small distomedian spine; mesial margin unarmed; 1.7–2 × as long as article 4. Antennal scale nearly reaching end of article 5, or overreaching midlength but not reaching end of article 5; 2.5–3 × as long as wide.

Maxilliped 3: Coxa unarmed. Basis smooth along mesial ridge. Ischium without distal spine; crista dentata with minute denticles. Merus relatively wide, extensor margin without spine; flexor margin with a broad irregular process at mid-length. Otherwise unarmed.

Cheliped: Stout; 4.4–4.5 × pcl; surface granulate. Ischium with dorsal distal spine; ventral margin distally unarmed. Merus mesial surface with proximal row of low spines along juncture with ischium; with one small distomesial spine. Carpus surface slightly granulose; unarmed; as long as palm. Palm about 3 × as long as wide, unarmed. Dactylus 0.6 × as long as propodus; occlusal margins denticulate, without gape.

Pereopods 2–4: Decreasing in length and spination posteriorly; surface slightly setose and plumose (on dactyli). Merus dorsal and ventral margins unarmed; ventrodistally angular, not acute; length-width ratio [3.7]–3.2 (P2), [3.5]–2.7 (P3), [3.3]–2.5 (P4); P4 merus shortest, 0.6 × as long as P2 merus; P3 merus 0.8–0.9 as long as P2 merus. Merus 0.9–1.3 × as long as propodus (from P2–P4). Carpus dorsal margin unarmed; shorter than dactylus (carpus-dactylus length ratio 0.5–0.7). Propodus 5–6 × longer than wide; extensor margin smooth; flexor margin not inflated distally, with pair of distal spines, and additional [4]–7 (P2), 3–[4] (P3), [0]–1 (P4) spines; 1.6 × as long as dactylus. Dactylus gently curved; flexor margin with 12–14 sharp, triangular spines along entire length, all slightly inclined, regularly and loosely arranged; ultimate, penultimate and antepenultimate spines subequal in size.

Colour in life. Unknown.

Etymology. Named after the voyage NIRVANA (Nascent Inter-Ridge Volcanism And Neotectonic Activity, TAN1213), that sampled the Kermadec Arc, Havre Trough, and Colville Ridge in 2012. Used as a noun in apposition.

Remarks. A pair of specimens referred here to *U. nirvana* **sp. nov.** was collected in 2012 from a yet-unnamed seamount feature on Colville Ridge, informally referred to as “Colville Volcano” (Wysoczanski *et al.* 2012). Unfortunately, the carapace of the male paratype is damaged and its chelipeds are missing. Minor differences between the female holotype and the male paratype are the lateral orbital angle, which is smooth and rounded in the holotype, but bears a small spine in the paratype; the anterior angle of the pterygostomian flap is blunt in the holotype

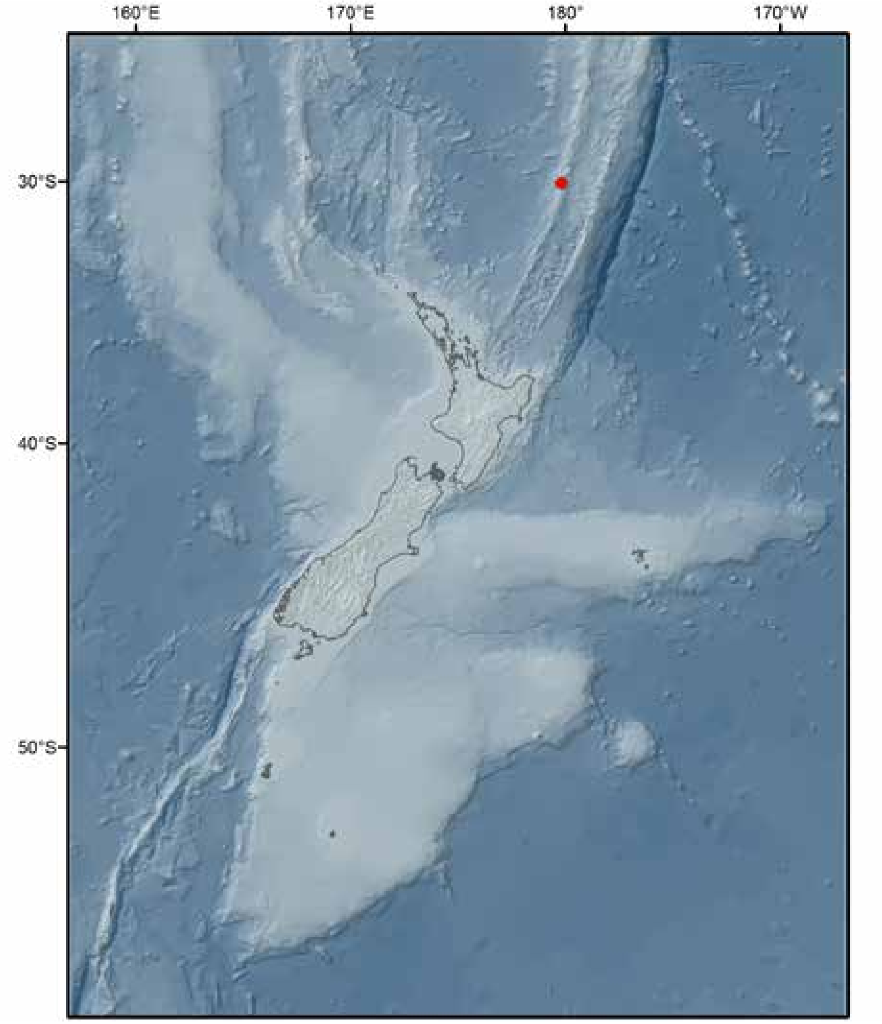


Figure 130. Distribution of *Uroptychus nirvana* **sp. nov.** around New Zealand.

and more angular with a small spine in the paratype; the antennal scale bears a lateral spine on both sides in the holotype, which is absent in the paratype (the right scale is truncated, presumably in the process of regeneration) (Fig. 129). The specimens agree in all other key characters.

Morphologically, *U. nirvana* **sp. nov.** belongs to a group of comparably large species with an unarmed carapace that is finely granulated over the entire dorsal margin and with relatively massive chelipeds. This group includes e.g. *U. anacaena*, *U. brachydactylus*, *U. brucei*, *U. inermis,* and *U. maori*, the latter two also recorded in New Zealand.

In overall shape and appearance, *U. nirvana* **sp. nov.** is most similar to *U. maori* Borradaille, 1916, which is known from the northern New Zealand shelf and ridges (see above), and its close ally *U. brucei* Baba, 1986 from western Australia and Indonesia. It differs from both of these in lacking a strong ventromesial spine on the cheliped ischium. From *U. maori* it also differs in lacking the unique long, curved dorsal spine on the cheliped ischium; having the antennal peduncle with a distinct distal spine on both distal articles (the articles lack a distinct spine in *U. maori*); the proportion of P2–4 dactyli compared to the length of the propodi is 0.4–0.5 × in *U. maori* but about two-thirds in both specimens of *U. nirvana* **sp. nov.**, and P4 propodus is armed with six to eight spines in addition to a distal pair in *U. maori* but with a distal pair of spines only in *U. nirvana* **sp. nov.** Also, the pterygostomian flap in *U. maori* has a distinct sharp anterior spine, while it is anteriorly angular, without a distinct spine in *U. nirvana* **sp. nov.** *Uroptychus nirvana* **sp. nov.** can also be closely allied with *U. orientalis* and *U. anacaena*, both described by Baba & Lin (2008) from Taiwan. It differs from both in having the antennal article 4 with a distal spine (absent in both others); in having the Mxp3 merus wide and expanded along the flexor margin (a slender, unarmed merus in both other species); and in having the proportionately short P2–4 dactyli (less than twice the length versus more than twice as long).

Uroptychus nirvana **sp. nov.** differs from all other New Zealand species that have a similar carapace form by the relatively long P2–4 dactyli; *U. aotearoa* **sp. nov.**, *U. empheres* Ahyong & Poore, 2004, *U. inermis* Baba, 2018, and *U. litosus* Ahyong & Poore, 2004, all have dactyli that are equal to or shorter than the carpi, in *U. nirvana* **sp. nov.** the dactyli are longer than the carpi with a carpus-dactylus ratio ranging from 0.7–0.5 (the carpus is slightly shortening and the dactyli are slightly lengthening from P2 to P4).

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.0% (two specimens). Interspecific sequence divergences: ≥ 14%.

ZooBank registration. *Uroptychus nirvana* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:CB3AB58A-543D-462F-BBA5-76027D1375FA.

Uroptychus novaezealandiae Borradaile, 1916 Figs 131, 132

Uroptychus novaezealandiae Borradaile, 1916: 93, fig. 7; Schnabel 2009b: 29 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list); Baba 2005: 229 (synonymies, key); Baba *et al.* 2008: 38 (list and synonymies); Baba 2018: 28 (key).
Uroptychus novaezelandiae, Schnabel 2009a: 559, figs 10, 11.

Type & locality. Holotype—NHMUK 1917.1.29.117, *Terra Nova* Stn 96, 34°25′S, 173°10′E, off North Cape, 128 m, female (cl 4.1 mm).

Distribution. Only known from type locality off North Cape, New Zealand, 128 m (Fig. 132).

Habitat. Unknown.

Diagnosis. Carapace smooth and unarmed on dorsal surface, widening posteriorly, with acute anterolateral spine and one large lateral spine on anterior part of branchial region. Rostrum narrow triangular, slightly longer than one-third pcl. Abdomen smooth and unarmed. Anterior margin of thoracic sternite 3 shallow concave with V-shaped median notch, no submedian spines. Ocular peduncle about 3 × longer than wide; cornea approximately one-fifth length of remaining stalk, nearly reaching end of rostrum. Sternal plastron slightly wider than long. Antenna stout, article 4 with strong distal spine, article 5 unarmed; antennal scale falling short of article 5. Mxp3 merus and carpus with small distal spine on extensor margin.

Based on figure of holotype, the following observations can be added: cheliped stout, smooth; carpus approximately length of carapace without rostrum; two distodorsal spines on merus and carpus. Pereopods 2–4 propodi with row of spines on flexor margin, not inflated; dactyli distally narrowed, with regular row of spines along flexor margins.

Colour in life. Not known.

Remarks. As discussed in Schnabel (2009a), the holotype of *U. novaezealandiae* collected during the *Terra Nova* Expedition in 1911 remains the only known specimen of this species. It shares the elongate ocular peduncle (3 × longer than broad) and a single spine (other than the anterolateral spine) along the lateral carapace margin with *U. rungapapa* **sp. nov.**; differences between these species are discussed below.

Uroptychus numerosus Baba, 2018 Figs 133, 134

Uroptychus numerosus Baba, 2018: 359, figs 176, 177.

Type & locality (not examined). Holotype—MNHN-IU-2014-16830, BIOGEOCAL Stn DW307, 20°35.38′S, 166°55.25′E, New Caledonia 470–480 m, 1 May 1987, male (pcl 4.1 mm).

Material examined. *Colville Ridge*: NIWA 86088, NIWA Stn TAN1213/18, 30°11.2–11.3′S, 179°43.3–43.1′E, 380–440 m, 18 Oct 2012, 1 male (5.7 mm, pcl 2.9 mm; sequenced, see Fig. 5).

Distribution. Loyalty Basin (east of New Caledonia), 470–480 m; Colville Ridge, 380–440 m (Fig. 134).

Habitat. The New Zealand specimen of *U. numerosus* was collected from a small volcanic cone on the Colville Ridge (NIRVANA station TAN1213/18), which included many unusual biological samples, including hard corals and undescribed gorgonians of the families Plexauridae and Primnoidae along with several basaltic rocks. A number of photographs of *U.* cf. *numerosus* showed a strong preference for branched antipatharians in the Central Pacific (Wicksten 2020).

Diagnosis. Spiny species, entire carapace, rostrum, pterygostomian flap, abdomen, all segments of cheliped, walking legs and anterior portion of sternum densely covered with slender sharp spines. Carapace slightly widening posteriorly, convex posterior to cervical groove; covered with very long slender spines. Rostrum about as long as remaining carapace, slender, with 9 or 10 spines along entire lateral margin. Excavated sternum with distinctly ridged midline. Sternite 3 with median notch flanked by submedian spines, produced to spine anteriorly, with small spines on surface of sternites 3 and 4. Sternite 4 with strong spines anteriorly and laterally. Abdominal tergites 2–5 laterally projecting and tapering to acute point. Antennal article 2 with strong distolateral and mesial spine; article 3 with distomesial spine; article 4 with distal spine and small mesial marginal spine; article 5 with distomesial and distolateral spines and 1 or 2 small mesial marginal spines; antennal scale overreaches midlength of article 5. Cheliped 3–4 × cl (6–7 × pcl), with 8 longitudinal rows of spines. Ischium with distal pair of long slender spines dorsally; carpus subequal in length to palm; fingers 0.4 × length of palm. P2–4 covered with rows of spines on all sides; P4 merus 0.7 × length of P2 merus. Propodi with spines along extensor margin and along lateral surfaces; flexor margin not inflated; 7–10 spines along entire length, excluding long distal pair of spines, distal spines in zigzag arrangement; dactyli relatively straight, tapering distally, with 7 or 8 sharp triangular spines loosely

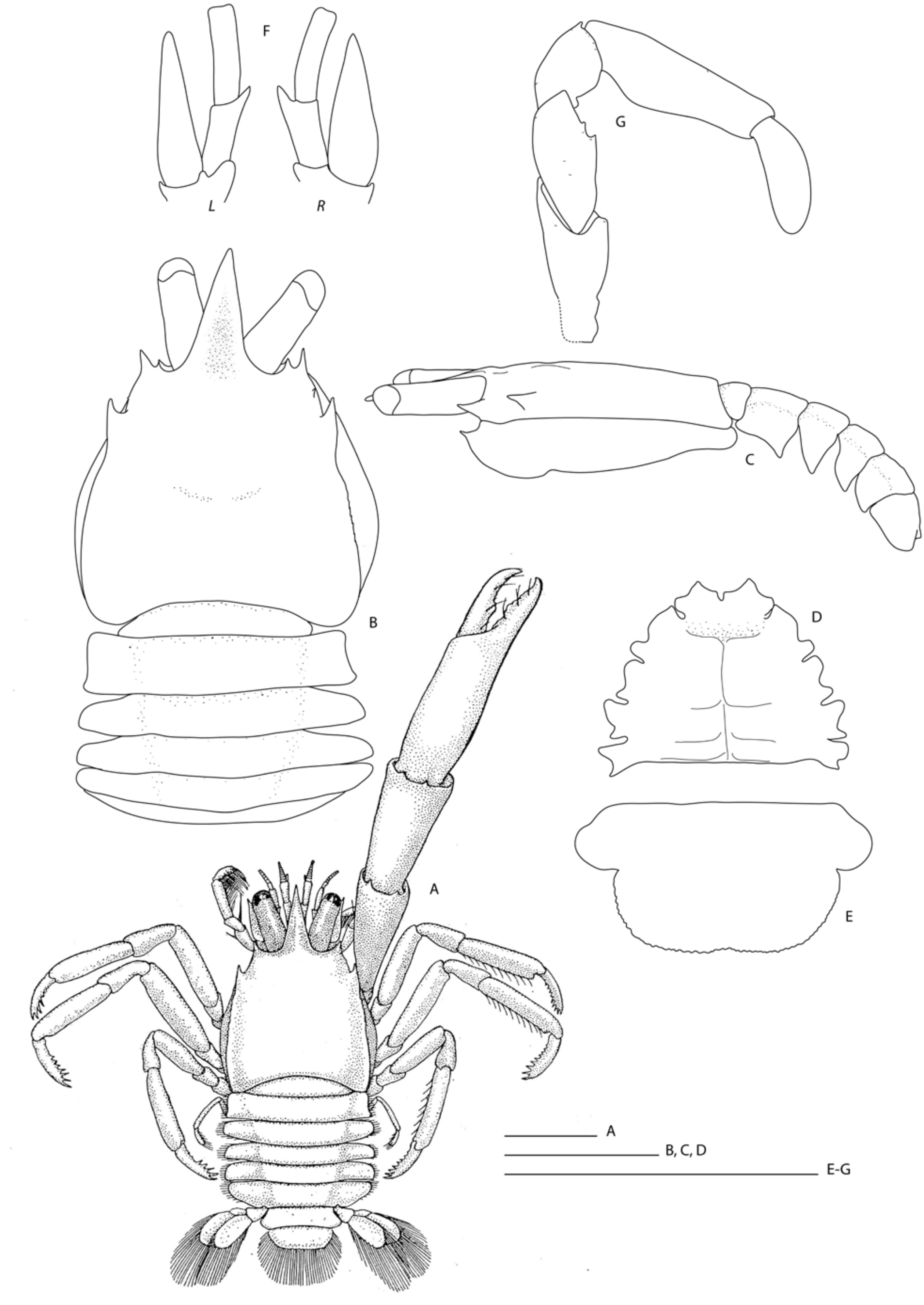
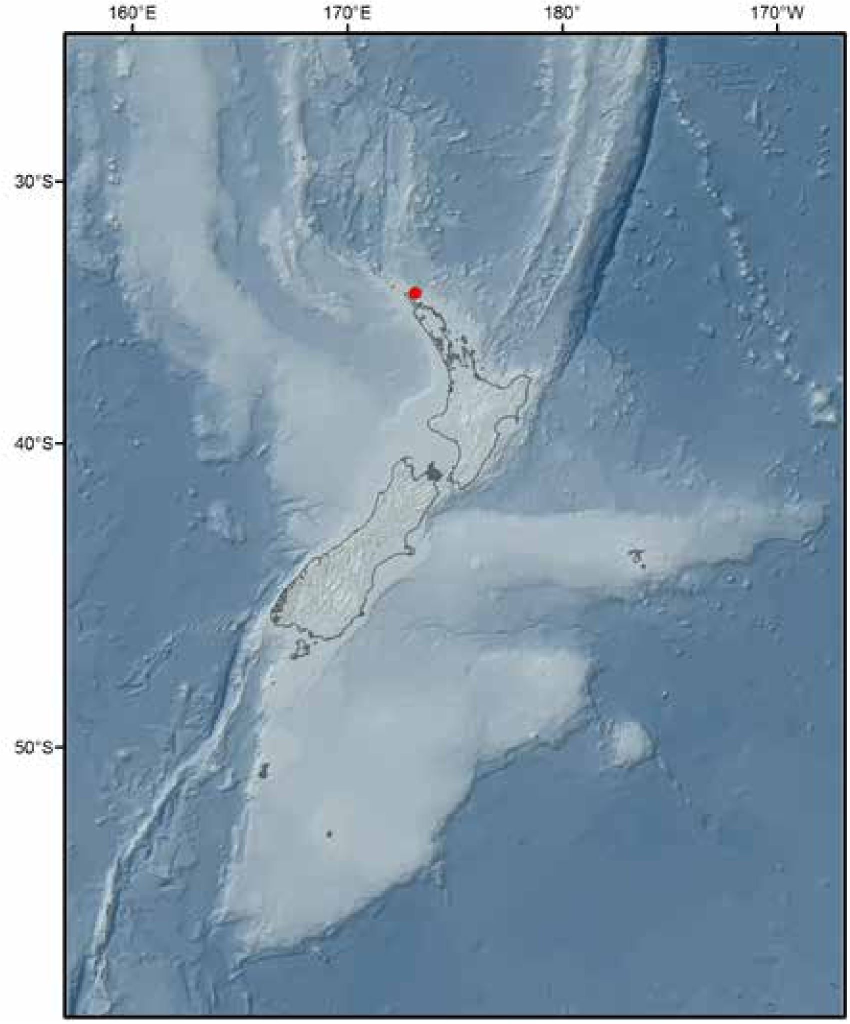


Figure 131. *Uroptychus novaezealandiae* Borradaile, 1916, holotype female, NHMUK 1917.1.29.117: **A.** dorsal habitus; **B.** carapace and abdomen, dorsal; **C.** carapace and abdomen, lateral; **D.** sternal plastron; **E.** telson, setae omitted; **F.** antennae, right and left, ventral; **G.** endopod of Mxp3, right, lateral. Scale bars = 2 mm (approximate for A). A, after Borradaile (1916); B–G, after Schnabel (2009).

Figure 132. Distribution of *Uroptychus novaezealandiae* Borradaile, 1916 around New Zealand.



arranged along flexor margin (excluding distal).

Colour in life. Not known.

Remarks. *Uroptychus numerosus* was described based on a pair of slightly larger specimens from New Caledonia (male holotype pcl 4.1 mm, ov. female paratype 4.3 mm). Slight differences between the New Zealand specimen and the types include the curvature of the rostrum (the type specimens have a straight and horizontal rostrum, while the male examined here has a slightly curved, ventrally deflected rostrum), proportions of antennal articles (the type material has the article 5 1.4 × longer than article 4 [1.1 × in New Zealand specimen]). According to Baba (2018: fig. 177) the proximal extensor margins on the dactyli of P2–4 are less uneven than in the New Zealand specimen (Fig. 133). Otherwise, all characters appear to be consistent.

The strongly spinose surfaces (including cheliped palm and abdominal segments), thoracic sternite 3 with median notch and uninflated P2–4 propodal flexor margins align *U. numerosus* with *U. ciliatus* (van Dam, 1933), *U. spinirostris* (Ahyong & Poore, 2004) and three species recently described by Baba (2018): *U. abdominalis*, *U. quartanus* and *U. senarius*. *Uroptychus numerosus* differs from all of these in having a very long rostrum, as long as the pcl (shorter in all other species) and in having scattered spines on the surface of thoracic sternite 3. All except for *U. spinirostris* have spines restricted to abdominal somites 2–5, while *U. spinirostris* and *U. numerosus* have spines on all six somites. These two species can easily be distinguished, however, with *U. spinirostris* having two pairs of spines along the proximal portion of the rostral lateral margin, and the antennal scale overreaching the peduncle. Instead, *U. numerosus* has nine or ten spines along the entire length of the rostrum and the antennal scale falls short of the end of the peduncle.

In New Zealand, *U. numerosus* most closely resembles *U. spinirostris* (Ahyong & Poore, 2004) (discussed above) and *U. sadie* **sp. nov.**, which have fewer and smaller spines on the rostrum and dorsal carapace, lack spines on abdominal somites 3–6, and the distal portion of the P2–4 propodi being inflated in *U. sadie* **sp. nov.** (versus margins parallel in *U. numerosus*).

Characters that are proving to be useful as diagnostic are the arrangement of the spines along the distal flexor margin of the P2–4 propodi. These spines are usually arranged along a single line following the single or paired distal spine. In *U. sadie* **sp. nov.**, *U. numerosus,* and at least in some of the specimens of

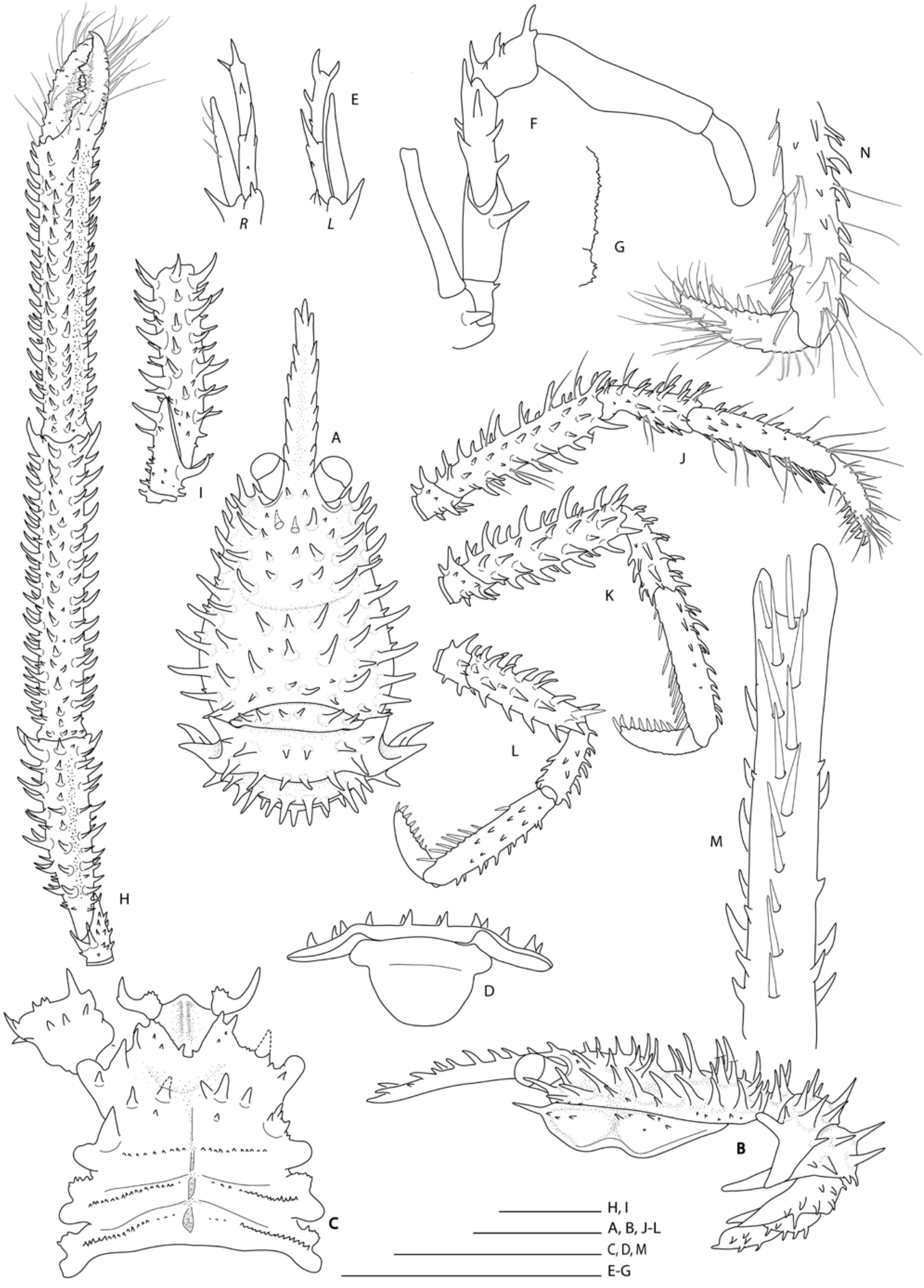
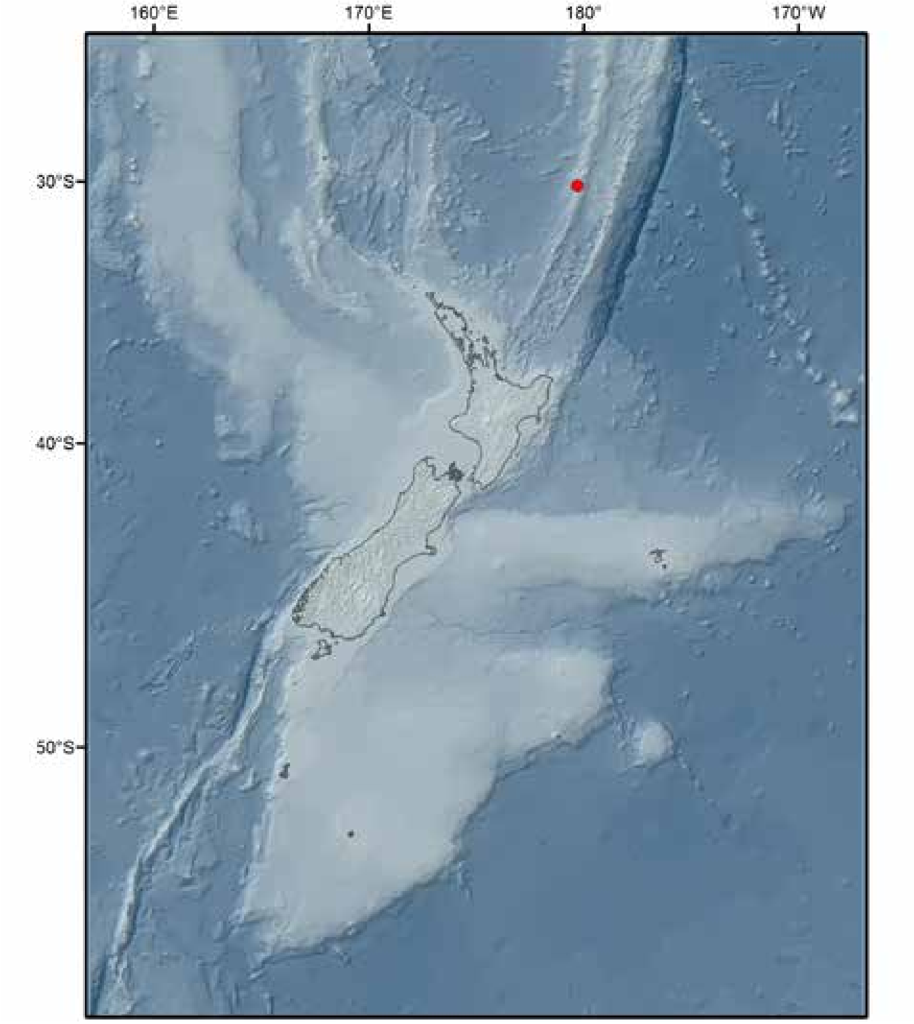


Figure 133. *Uroptychus numerosus* Baba, 2018, male, NIWA 86088: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** sternal plastron and coxa of Mxp3 and right cheliped; **D.** telson and posterior portion of abdominal somite 6; **E.** antennae, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata, right; **H.** right cheliped, dorsal; **I.** right cheliped, ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of P3 propodus flexor margin, ventral; **N.** dactylus and distal portion of P3 propodus, lateral. Scale = 2 mm.

Figure 134. Distribution of *Uroptychus numerosus* Baba, 2018 around New Zealand.



U. spinirostris, they are arranged in a distinct zigzag pattern, offset from each other. Baba (2018) mentioned that this character is also shared by *U. ciliatus* (van Dam, 1933), *U. quartanus*, and *U. senarius*, but this character is also apparent in other species such as *U. naso*, *U. macrolepis,* or *U. zigzag*, which vary greatly otherwise.

A second character that has become more prominent recently is the morphology of the excavated sternum. In *U. sadie* **sp. nov.**, *U. numerosus,* and *U. spinirostris*, the midline is always sharply and distinctly ridged or cristate. This is also shared with *U. paku* and *U. tracey*, but not with *U. taniwha* **sp. nov.** or *U. taratara* **sp. nov.**, the other spinose species in New Zealand. Both *U. quartanus* and *U. senarius* also share this character.

DNA sequence data. Interspecific sequence divergences for partial CO1 gene: >15%.

Uroptychus paku Schnabel, 2009 Figs 135, 136

Uroptychus paku Schnabel, 2009a: 562, figs 7, 12; Schnabel 2009b: 29 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list); Baba 2018: 369, fig. 182.

Material examined. Holotype—NIWA 9805, Stn Z9044, 32°11.10′S, 179°05.20′W, L'Esperance Rock, Kermadec Ridge, 122–307 m, 6 Apr 1998, 1 female (3.1 mm, pcl 1.7 mm).

Type locality. L'Esperance Rock, Kermadec Ridge, 122–307 m.

Distribution. Kermadec Ridge, 122–307 m (Fig. 136); Norfolk Ridge, 430–530 m (Baba 2018).

Habitat. Unknown.

Diagnosis. Carapace (pcl) more than 1.5 × longer than broad; lateral carapace margins subparallel, with 5 spines (excluding anterolateral spine), posteriormost largest; dorsal surface with row of small epigastric spines, two small submedian spines on anterior cardiac margin, and one pair of posterior branchial spines. Rostrum narrow, basal breadth around half distance between anterolateral spines. Abdomen unarmed. Excavated sternum distinctly ridged at midline. Pereopods 2–4 with spines on dorsal crest of merus and carpus; propodus with terminal pair of spines only; dactyli slender and elongate, with 8–12 inclined, loosely arranged spines, ultimate spine very slender, penultimate spine prominent, more than twice as broad as antepenultimate.

Colour in life. Unknown.

Figure 135. *Uroptychus paku* Schnabel, 2009., holotype female, NIWA 9805: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** sternal plastron, with excavated sternum magnified; **D.** telson; **E.** antenna, right, ventral; **F.** endopod of Mxp3, left, lateral; **G.** right cheliped, dorsal; **H–J.** right P2–4; **K.** dactylus and distal portion of propodus of right pereopod 3, lateral. Scale bars = 1 mm. Modified after Schnabel (2009).

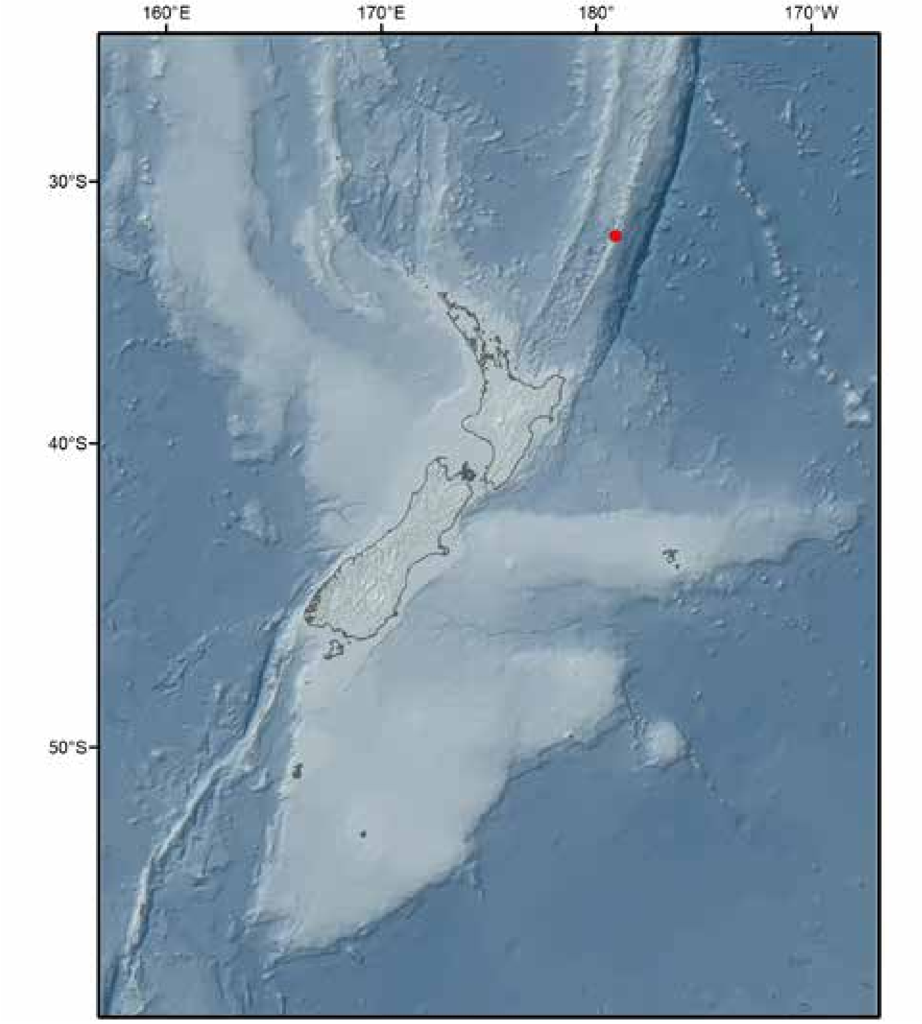


Figure 136. Distribution of *Uroptychus paku* Schnabel, 2009 around New Zealand.

Remarks. No further specimens of *U. paku* Schnabel, 2009 have been collected around New Zealand since it was first described, but Baba (2018) provided a new record (one female, pcl 3.4 mm) from the northern Norfolk Ridge, extending the depth range to 430–530 m. He reported that the larger female "differs from the holotype in having sternite 4 more produced anteriorly, the pterygostomian flap bearing small spines, the P2–4 propodi proximally bearing extensor marginal spines and carpi bearing additional row of small spines paralleling the row of extensor marginal spines, and seven epigastric spines" (Baba 2018: 371) and added that these differences might be a result of allometric variation.

The similarities of *U. paku* to *U. sexspinosus* Balss, 1913 and *U. nanophyes* McArdle, 1901 are discussed by Schnabel (2009a) and Baba (2018), respectively. In New Zealand, *U. paku* is most similar to those species that bear spines on the posterior portion of the carapace but have an unarmed abdomen. This includes *U. taratara* **sp. nov.**, *U. taniwha* **sp. nov.** and *U. tracey* Ahyong, Schnabel & Baba, 2015. *Uroptychus paku* can be easily distinguished by the combination of the following characters: the cheliped palm is smooth and the penultimate spine of the P2–4 dactyli is prominent (distinctly spinose and the two distal spines are subequal in *U. taratara* **sp. nov.**); bear dorsal spines on the meri and carpi (unarmed in *U. taniwha* **sp. nov.**) and a distal pair of spines only on propodi (with additional proximal spines in *U. taratara* **sp. nov.** and *U. tracey*); a distinctly ridged midline on the excavated sternum (shared with *U. tracey* but absent in *U. taniwha* **sp. nov.** and *U. taratara* **sp. nov.**); and the posteriormost spine along the carapace lateral margin being most prominent (smaller than preceding spines in all other species).

Uroptychus palmaris Baba, 2018 Figs 137, 138

Uroptychus palmaris Baba, 2018: 372, figs 183, 184.

Type & locality (not examined). Holotype—MNHN-IU-2011-5975, NORFOLK 1 Stn CP1669, 23°41′S, 168°01′E, 302–325 m, 21 Jun 2001, female ov. (pcl 2.2 mm).

Material examined. *Off Lord Howe Island (Australian EEZ)*: NIWA 10894, Stn P115, 31°25.9′S, 159°02.2′E, 183–79 m, 31 May 1977, 1 female ov. (3.4 mm, pcl 2.0 mm), on *Aphanipathes* antipatharian coral.

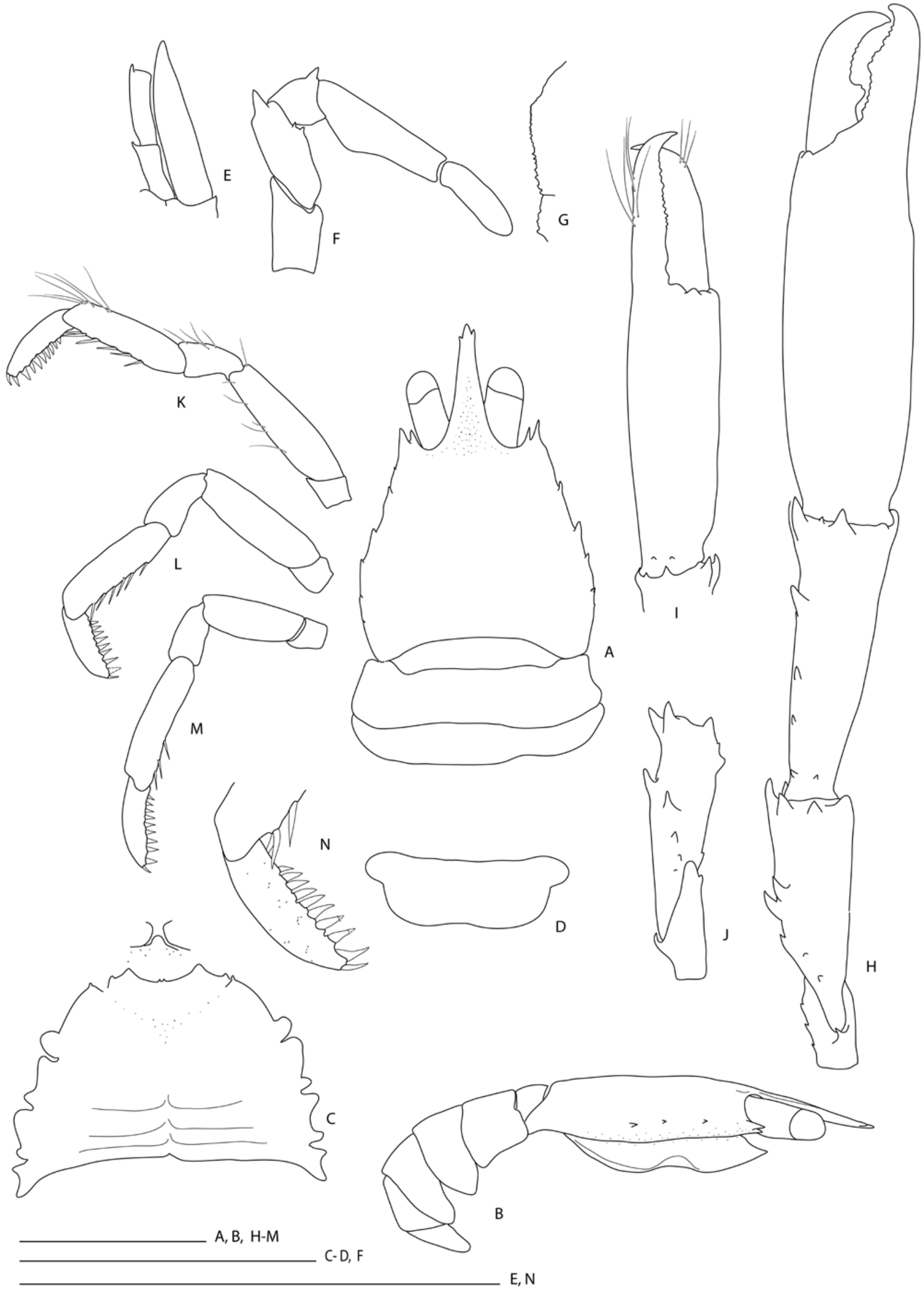
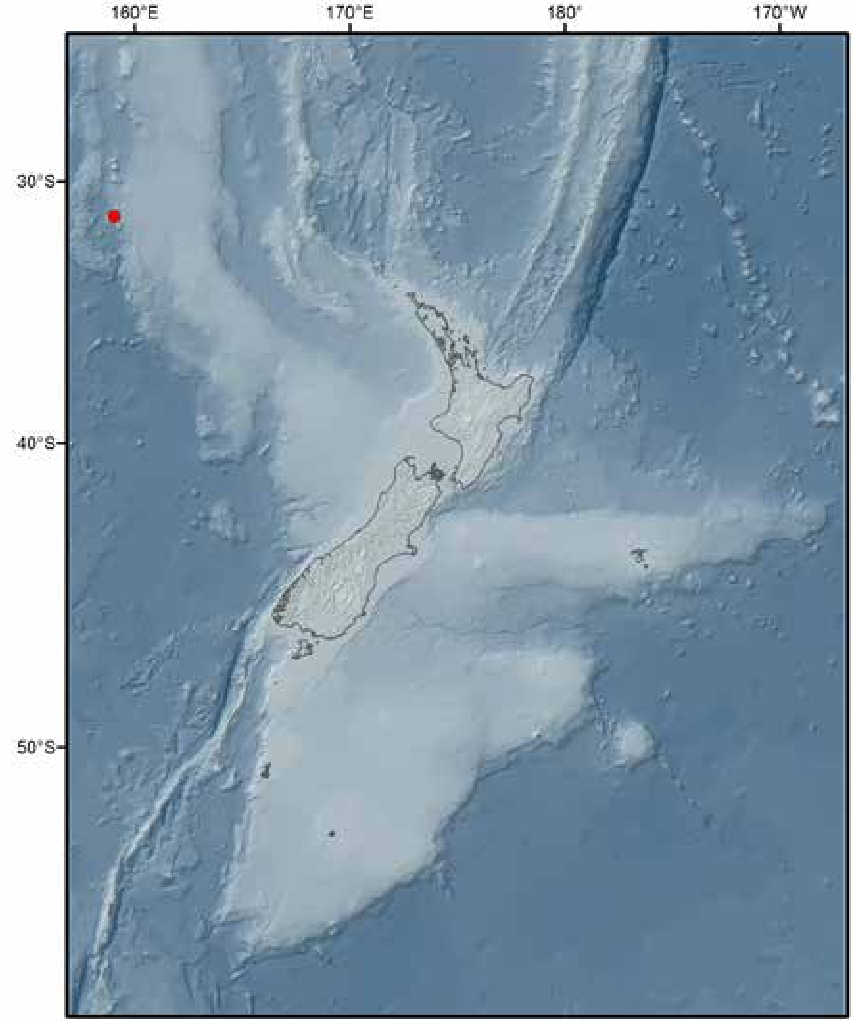


Figure 137. *Uroptychus palmaris* Baba, 2018, female ov., NIWA 10894: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** left antenna, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata, left; **H.** right cheliped, dorsal; **I.** left cheliped distal carpus, palm and fingers, dorsal; **J.** ischium and merus of left cheliped, lateral; **K**, **L.** loose left P2 and P3, lateral; **M.** left P 4; **N.** distal propodus and dactylus of P2 or P3, lateral. Scale = 2 mm.

Figure 138. Distribution of *Uroptychus palmaris* Baba, 2018 around New Zealand.



Distribution. Norfolk Ridge (232–325 m; Baba 2018) and now off Lord Howe Island; 79–183 m (Fig. 138).

Habitat. Of the type series, notes from two of the four stations indicate associations with antipatharians (Baba 2018). A note by Dennis Opresko, Research Associate, Smithsonian Institution, and black coral expert, states that the specimen was taken off an undescribed species of black coral (*Aphanipathes*; D. Opresko pers. comm.) and the left cheliped was preserved firmly clasping onto a small branch of the coral. Three different species of Antipatharia have been collected at the same station (belonging to the genera *Asteriopathes*, *Myriopathes* and *Aphanipathes*).

Diagnosis. Carapace lateral margins distinctly divergent posteriorly, with 4–6 small but distinct spines in addition to prominent anterolateral spine, dorsal surface smooth, only feebly convex. Lateral orbital spine slightly smaller than and overreached by anterolateral spine. Rostrum narrow triangular, with subapical spines or apical serration. Pterygostomian flap anteriorly acute and surface smooth. Anterior margin of thoracic sternite 3 shallow concave, with two small, contiguous median spines, lacking median notch. Ocular peduncle elongate, around 2 × longer than broad. Cheliped palm very broad, can be nearly as wide as, or wider than, the distance between the anterolateral spines. P2–4 meri and carpi unarmed; propodal flexor margin without marked projection, with 2–5 spines in addition to distal pair; dactyli distally narrowing (not truncate), longer than carpi, flexor margin with 9 or 10 sharp triangular spines, arranged perpendicular to margin, penultimate spine broader than ultimate and subequal to proximal group of spines.

Colour in life. Not known.

Remarks. *Uroptychus palmaris* was described from New Caledonia and the Norfolk Ridge from 232–325 m, and the present record from off Lord Howe Island extends the distribution further south and across to the Lord Howe Rise, as well as into shallower depth, 79–183 m. The present specimen is not well preserved, with all except for the left P4 detached from the body and the cuticle appears nearly transparent.

Uroptychus palmaris is a small species, with all specimens known to date with a pcl of ≤ 2.3 mm in length. It is distinct in the combination of the shallow convex carapace, which is entirely smooth, the lateral margin with a few small spines, the uniquely formed anterior sternite, which is shallow concave with two small contiguous median spines but lacking a median notch, and the spination of the pereopods. The cheliped is massive, at 5.2–7.1 × pcl in the type material (Baba 2018) and in the NIWA specimen, 5.6 × pcl on the right and 4.9 × pcl on the left. The cheliped palm is prominent in all specimens, the right palm of the specimen examined here is longer than the carapace (including rostrum), and the width is subequal to the distance between the anterolateral spines of the carapace (the left cheliped is much smaller in this case) (Fig. 137).

The small size, shallow lateral carapace curvature, overall dorsal carapace shape, and elongate ocular peduncle of *U. palmaris* appear similar in *U. novaezealandiae* Borradaile, 1916. *Uroptychus palmaris* differs in the less elongate ocular peduncle, a length-width ratio of less than three (greater than three in *U. novaezealandiae*); the lateral carapace margin is furnished with four to six small spines (*U. novaezealandiae* has only one prominent anterior branchial spine, a minute lateral hepatic spine can be present); the anterior sternite 3 is lacking a median notch but has a pair of minute submedian spines (a notch is clearly present but lacking submedian spines in *U. novaezealandiae*); and the antennal peduncle has small distal spines on each of the distal articles, with the antennal scale overreaching the peduncle (*U. novaezealandiae* has a spine only on antennal article 4 and the scale falls short of the end of the peduncle). Unfortunately, all pereopods are missing in the single known specimen of *U. novaezealandiae*, and comparisons drawn from historic illustrations might not be reliable.

***Uroptychus pars* sp. nov.** Figs 139, 140

Material examined. Holotype NIWA 119306, Kermadec-Rangitahua Stn TAN1612/131, 32°25.60–25.56′S, 179°09.03–09.02′W, Star of Bengal Bank, Kermadec Ridge, 156–161 m, 04 Nov 2016, female (2.2 mm, pcl 1.4 mm; sequenced, see Fig. 5), off large primnoid coral.

Type locality. Star of Bengal Bank, Kermadec Ridge, 156–161 m.

Distribution. Known only from the type locality (Fig. 140).

Habitat. The single specimen of *U. pars* **sp. nov.** was extracted from a bushy primnoid coral collected on the Star of Bengal Bank, 103 km south-southwest of L'Esperance Rock on the central Kermadec Ridge.

Diagnosis. Carapace dorsal surface unarmed, minutely granulate at most; anterolateral spine and lateral orbital spine strong, subequal, orbital spine overreaching anterolateral spine; lateral margins minutely granulate along anterior half, with dorsoventrally flattened, laterally rounded, wing-like ridge along branchial margin. Rostrum width at base < 0.5 × distance between anterolateral spines; distally with 3 adjacent spines. Abdominal tergites smooth, pleuron 2 anteriorly produced. Antennal article 2 fused with antennal scale. Ocular peduncle with inflated field of granules dorsodistally, proximal to cornea. Cheliped merus and carpus with scattered large spines, merus dorsodistally with trifurcate process. P2 merus shortest, much shorter than pcl; P2–4 meri and carpi spinose on extensor margin; propodi with pair of terminal spines only; dactyli distally tapering (not truncate), with 11–13 closely-arranged, nearly contiguous, inclined spines along flexor margin, ultimate spine slender, penultimate spine prominent, about twice breadth of antepenultimate spine; remaining spines broader than ultimate.

Description. Carapace: pcl 0.6 × width, shallow convex from side to side. Dorsal surface smooth except for scattered, minute granulation on hepatic region; cervical groove not deep but distinct; cardiac region slightly inflated; posterior branchial region unarmed. Lateral orbital spine sharp, subequal to anterolateral spine. Anterolateral spine well-developed, falling short of tip of lateral orbital spine; lateral margin distinctly constricted behind hepatic region; branchial margin laterally produced, with dorsoventrally flattened, laterally rounded, wing-like ridge, minutely serrate; hepatic region with a few minute granules; posterolateral corner rounded, without distinct ridge. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines), horizontal, 0.6 × pcl; 1.6 × longer than wide at base; dorsal surface excavated; with 3 contiguous spines distally. Pterygostomian flap covered with minute spines; 3 spines along anterior dorsal suture with carapace; anterior margin produced into long spine.

Sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron 1.7 × as wide as long, widening posteriorly; surface smooth. Sternite 3 anterolaterally acute; anterior margin shallow concave, median notch separating submedian spines; anterolateral margins rounded. Sternite 4 2 × width of sternite 3, anteriorly shallow concave, midline indistinctly grooved; anterolateral margin rounded, with small granule, subequal in length to posterolateral margin; laterally unarmed; Sternite 5 anterolateral margin triangular.

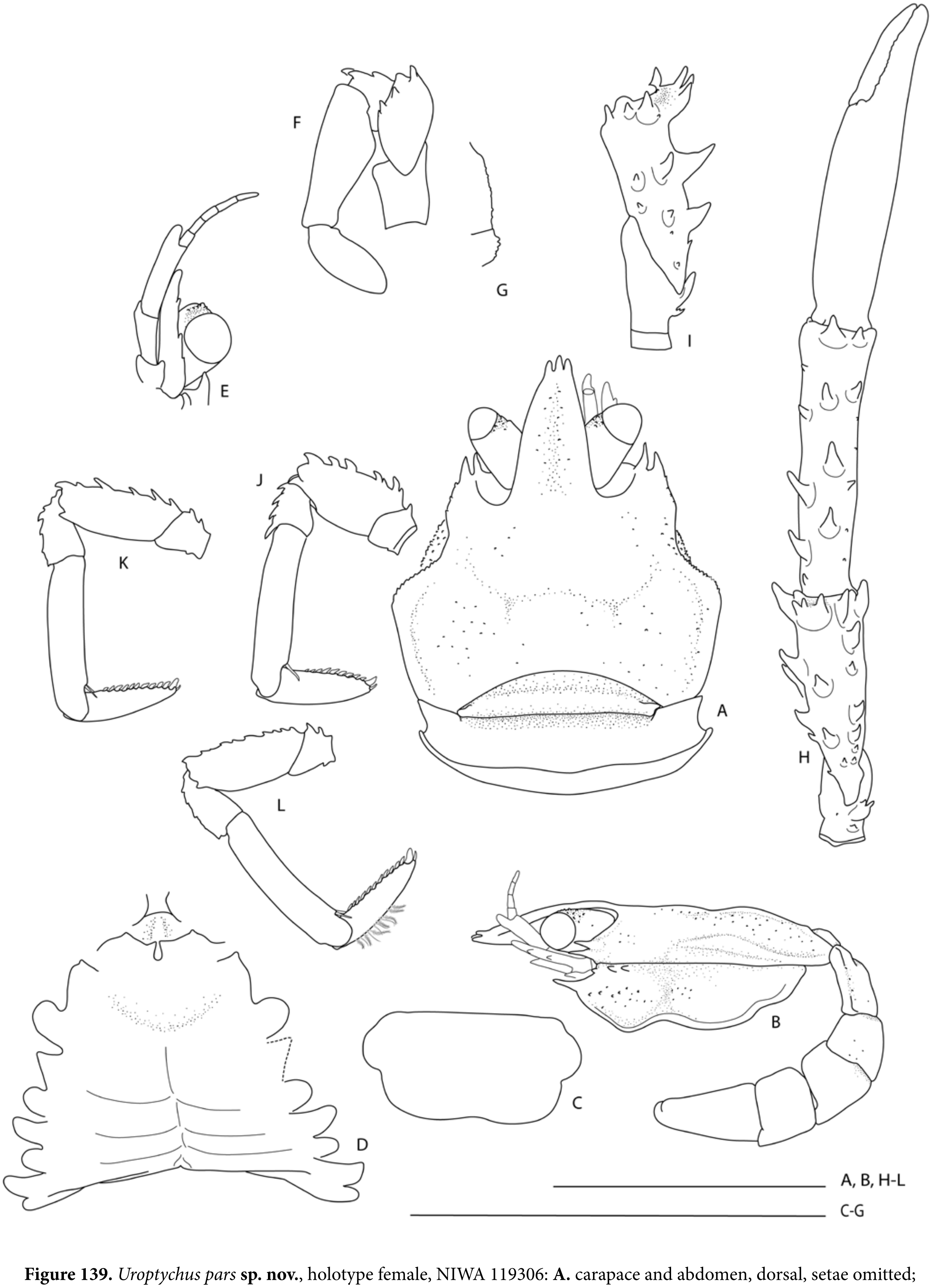


Figure 139. *Uroptychus pars* **sp. nov.**, holotype female, NIWA 119306: **A.** carapace and abdomen, dorsal, setae omitted; **B.** carapace and abdomen, lateral; **C**. telson; **D.** sternal plastron; **E.** antenna, ocular peduncle and anterolateral spine, left, ventral; **F.** endopod of Mxp3, left, lateral, setae omitted; **G.** crista dentata of right Mxp3; **H.** right cheliped, dorsal, setae omitted; **I.** ischium and merus of right cheliped, lateral; **J.** left pereopod 2, lateral; **K**, **L.** left pereopods 3 and 4, detached, lateral. Scale bars = 2 mm.

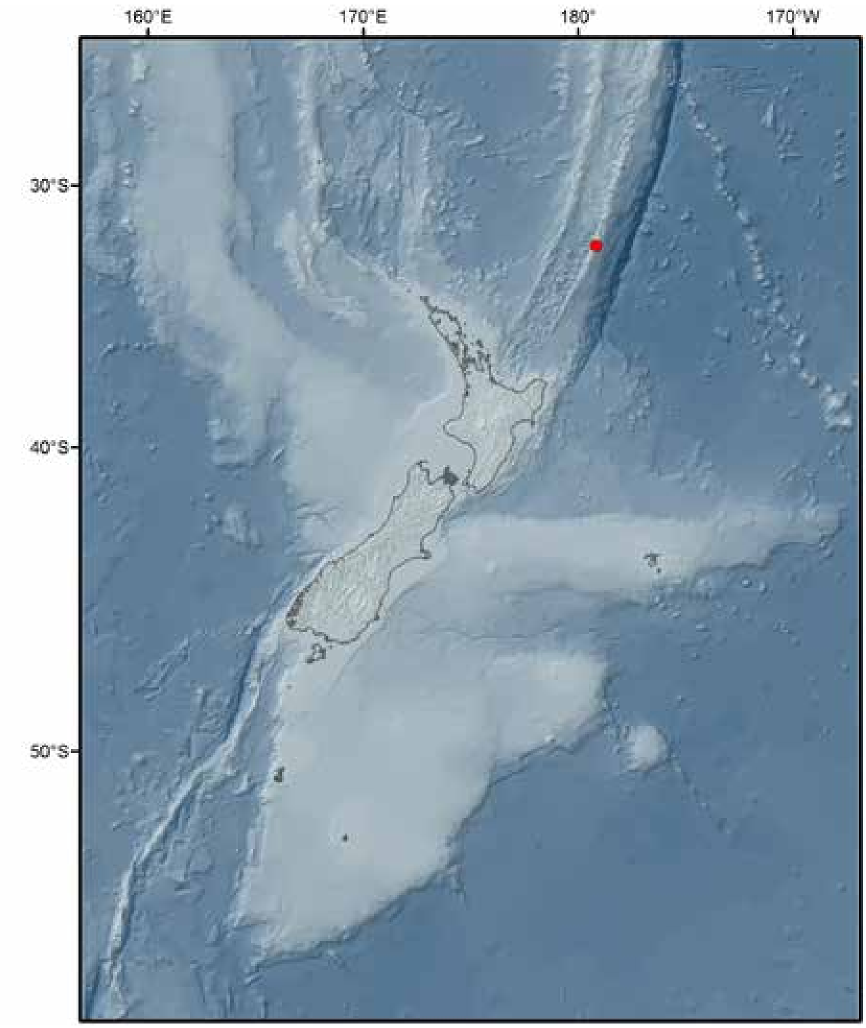


Figure 140. Distribution of *Uroptychus pars* **sp. nov.** around New Zealand.

Abdomen: Tergites smooth and unarmed; tergite 1 with low ridge dorsally; all remaining tergites without ridges. Pleural margins of somites 2–4 distally narrowing, pleuron 2 margin anteriorly produced to narrow angle. Telson 2 × as broad as long; posterior margin nearly straight (very slightly emarginate); posterior portion as long as anterior portion.

Eyes: With inflated field of granules dorsodistally, proximal to cornea. Cornea subglobular, 0.4 × length of ocular peduncle.

Antennal peduncle: Article 2 fused with antennal scale. Antennal article 3 unarmed. Article 4 with small distal spine; mesial margin unarmed. Article 5 with large rounded, blunt distomedian spine, lobe-like; mesial margin unarmed; 1.7–2.0 × as long as article 4. Antennal scale overreaching midlength but not reaching end of article 5.

Maxilliped 3: Coxa unarmed. Basis with a few small denticles along mesial ridge. Ischium without distal spines; crista dentata irregular, but unarmed. Merus extensor margin with distal spine; flexor margin with three median spines. Carpus with 2 distal and one proximal spine on extensor margin.

Cheliped: Slender; 5.4 × pcl; spinose. Ischium with dorsodistal spine, bifurcate. Merus, surface with large scattered spines; with 7 spines and trifurcate dorsodistal process distally. Carpus surface with scattered large spines; 2 ventral spines dorsodistally; length 1.2 × that of palm. Palm 3.3 × as long as wide, unarmed. Dactylus length 0.5 × as long as propodus; occlusal margins nearly smooth, without gape.

Pereopods 2–4: Similar; surface smooth. Merus with 6–8 spines on dorsal crest, including distal spine; ventral margin with distal spine. P2 merus shortest, 0.5 × pcl, P3–4 meri 1.2–1.3 × as long as P2 merus (P2 remains attached, P3 and P4 are detached). Merus 0.7 × as long as propodus. Carpus, dorsal margin with 3 or 4 spines, including distal; laterally unarmed. Propodus 4.2–4.7 × longer than wide; extensor margin smooth; flexor margin nearly straight, with distal pair of spines only; 1.3–1.5 × as long as dactylus. Dactylus nearly straight; flexor margin with 11–13 obliquely directed, nearly contiguous spines along entire length; ultimate spine distinctly smaller than penultimate spine and narrower than antepenultimate; penultimate spine largest, about twice as wide as antepenultimate, longer than all other spines; remaining proximal spines similar, arranged regularly and diminishing in size posteriorly.

Colour in life. Not known.

Etymology. Named *pars*, from the Latin word for 'wing', with reference to the lateral carapace processes; used as a noun in apposition.

Remarks. *Uroptychus pars* **sp. nov.** is one of the smallest species known to date (pcl 1.4 mm) and is highly unusual within the genus for the following combination of characters: the rostrum bears three distal spines that are adjacent in almost transverse arrangement (rather thann with the median spine placed anterior to the lateral spines), the carapace lateral margin bears a distinct wing-like dorso-ventrally flattened process along the entire branchial margin, the ocular peduncle bears a field of granules dorsodistally adjacent to cornea, the antennal article 2 is fused with the first article, and the cheliped bears a curved, trifurcate distal process on the merus (Fig. 139).

Considering the small size, proportionally wide carapace, prominent and subequal anterolateral and lateral orbital spines, spiny cheliped and stout and nearly contiguous spines along the flexor margins of P2–4 dactyli, *U. pars* **sp. nov.** most closely resembles *U. vulcanus* Baba, 2018 from the Loyalty Islands and Colville Ridge and New Zealand (see below). It is clearly distinguished from *U. vulcanus* by the dorsoventrally flattened process along the branchial margin of the carapace (*U. vulcanus* bears a number of spines instead), the trifurcate rostrum (serrate and narrowing to a single rostral tip in *U. vulcanus*), a distinct median notch flanked by submedian spines on the anterior margin of thoracic sternite 3 (shallow concave with a minute indication of a median notch in *U. vulcanus*), and the field of dorsodistal granules on the ocular peduncle (absent in *U. vulcanus*).

Uroptychus obtusus Baba, 2018, from the Norfolk Ridge may also be closely related to *U. pars* **sp. nov.**, sharing the small body size, the proportionately wide carapace, a fused antennal article 2, the shape of the antennal scale and the blunt distal spine on the article 5. In *U. obtusus* the rostral tip, however, is narrowed to a single point, not trifurcate, and the lateral branchial margin is not flattened into a broad process.

DNA sequence data. Closest interspecific sequence divergences for partial CO1 gene: 14.1–14.2% (*U. ihu* **sp. nov.**), 14.7% (*U. vulcanus*).

ZooBank registration. *Uroptychus pars* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:CE001A90-0F21-402E-A586-1875FA1724A9.

Uroptychus plumella Baba, 2018 Figs 141–143

Uroptychus plumella Baba, 2018: 404, figs 199, 200.

Type & locality (not examined). Holotype—MNHN-IU-2012-683, Bathus 3 Stn DW778, 24°43′S, 170°07′E, Loyalty Ridge, 750–760 m, 24 Nov 1993, female ov. (pcl 6.6 mm).

Material examined. *Reinga Ridge*: NMNZ CR.022691, NORFANZ Stn TAN0308/136, 33°23.59–23.43′S, 170°12.37–11.74′E, 469–490 m, 1 Nov 2003, 1 female (8.4 mm, pcl 5.7 mm), 1 male (7.3 mm, pcl 5.0 mm; sequenced, see Fig. 5); NMNZ CR.022690, NORFANZ Stn TAN0308/133, lot #21, 33°23.74–23.40′S, 170°13.03–11.57′E, 465–490 m, 1 Nov 2003, 1 male (8.5 mm, pcl 5.8 mm).

Distribution. Loyalty Ridge, New Caledonia, 750–760 m; Reinga Ridge, 465–490 m (Fig. 143).

Habitat. Unknown.

Diagnosis. Carapace dorsally smooth, with fine, plumose setae; laterally strongly convex, unarmed other than anterolateral spine (finely irregular margin in parts). Anterolateral spine directed anteriorly (not anterolaterally). Lateral orbital spine small, clearly falling short of anterolateral spine. Rostrum narrow triangular; lateral margin with small irregularities but unarmed; breadth at base 0.4 × distance between anterolateral carapace spines. Anterior margin of thoracic sternite 3 deeply V-shaped (submedian spines and notch absent). Ocular peduncle 1.4–1.5 × longer than broad. Antennal scale overreaching antennal article 5. Cheliped 4–5 × pcl; with granules or small spines along mesial meral surfaces and small distoventral and distodorsal spines and denticles, otherwise unarmed. P2–4 similar; meri dorsal margin unarmed; propodi with 4–8 spines along medially inflated flexor margin in addition to distal pair of spines; dactyli distally narrowed, with 7 or 8 large and sharp triangular spines, slightly oblique along flexor margin; ultimate, penultimate and antepenultimate subequal in size and arranged equidistantly.

Colour in life. Body uniformly orange to red colour (Fig. 141).

Remarks. *Uroptychus plumella* Baba, 2018 was described from a single ovigerous female collected from around 750 m on the Loyalty Ridge. The three NORFANZ specimens examined here were collected from slightly shallower depths, from the same longitude but 9° further south on the Reinga Ridge (Fig. 143).

The three New Zealand specimens of *U. plumella* are all slightly smaller than the holotype (pcl 6.6 mm) but match the type description well. Interestingly,

Figure 141. *Uroptychus plumella* Baba, 2018, male, NMNZ CR.022691 (left); male, NMNZ CR.022690 (right). Scale = 5 mm.

the entire body of the female is plumose, a character highlighted in the species name, but both males instead have fine plumose setae scattered less densely around the body, indicating this character might be subject to sexual dimorphism. Other slight differences between the New Zealand specimens and the type description are that the carapace is slightly narrower in both males (1.1 × broader than long), the female examined is similar to the female holotype (1.3 × broader than long); the rostrum is straight in all cases and not distally slightly upturned as described for the holotype; the excavated sternum in the illustrated male bears a minute granule on the median ridge (but this is absent in all other specimens and the holotype) (Fig. 142C).

Baba (2018) aligned *U. plumella* with *U. senticarpus* Baba, 2018 and *U. shanei* Baba, 2018 from the Norfolk Ridge and Vanuatu, respectively. These all have a carapace that is broader than long, laterally unarmed other than the anterolateral spine, sternite 3 with the anterior margin emarginate in a broad V-shape, cheliped nearly spineless, the P2–4 dactyli ending in a strong spine preceded by similar, proximally diminishing spines. These species are distinguished from each other by the antennal characteristics: article 2 laterally acuminate in *U. plumella* and *U. shanei*, with distinct spine in *U. senticarpus*; articles 4 and 5 each with distinct spines in *U. senticarpus*, small distal spines in *U. plumella* and unarmed in *U. shanei*; the antennal scale overreaching the peduncle in *U. plumella* and *U. senticarpus*, barely reaching the end of the peduncle in *U. shanei*; the pterygostomian flap anteriorly with small spine in *U. plumella* and *U. shanei*, with distinct spine in *U. senticarpus*; the cheliped carpus distodorsally with a spine in *U. plumella* and *U. senticarpus*, unarmed in *U. shanei*; and the P2–4 dactylar spines much more narrowly tapering and the ultimate spine remote to the penultimate spine, with a distance greater than that between the penultimate and antepenultimate spines in *U. shanei*, while the spines are broader and arranged regularly in *U. plumella* and *U. senticarpus*. Additionally, Baba (2018) made a distinction between the different angles at which the anterolateral spine is positioned: directly forward in *U. plumella*, anteromesially in *U. shanei*, and anterolaterally in

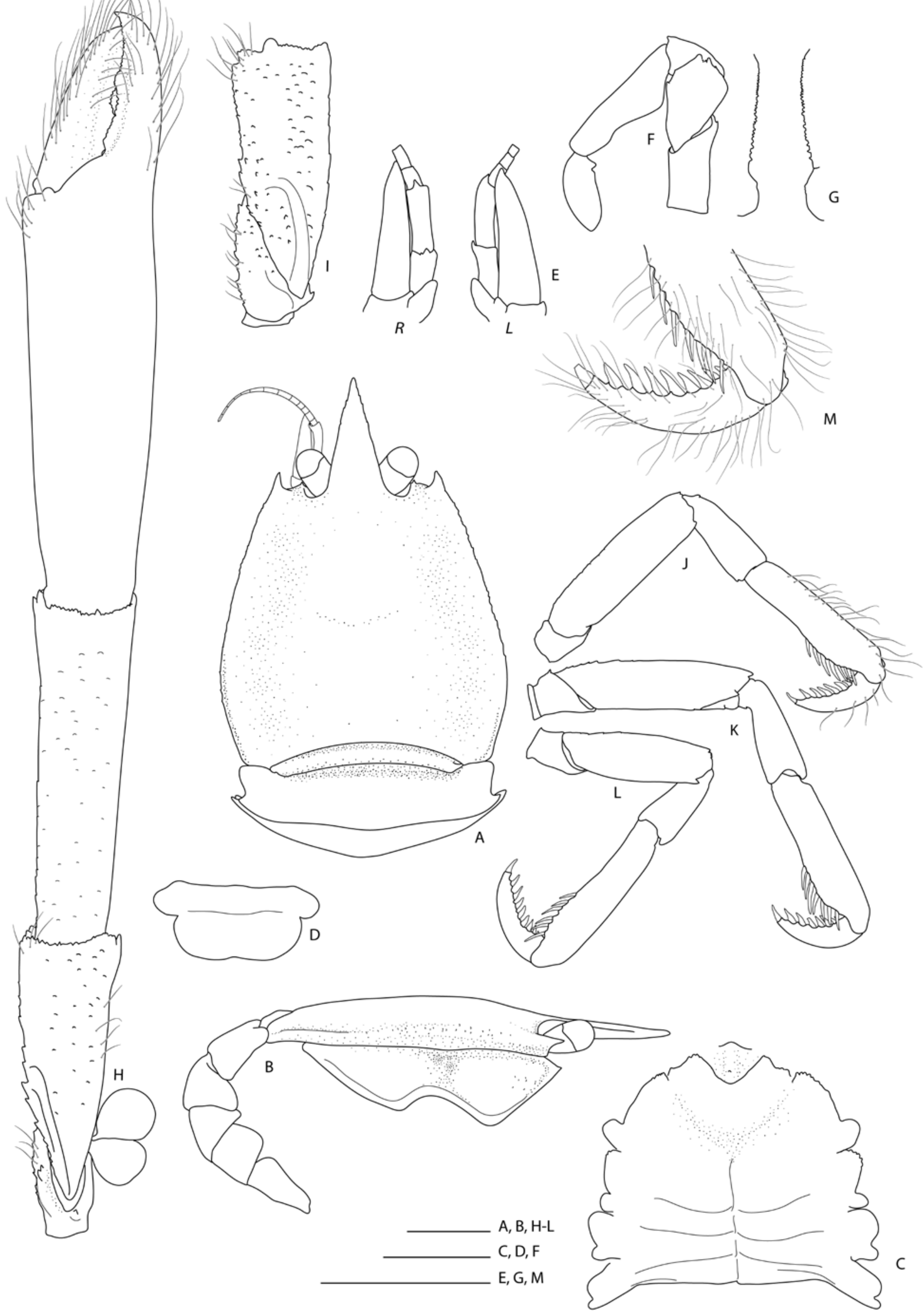
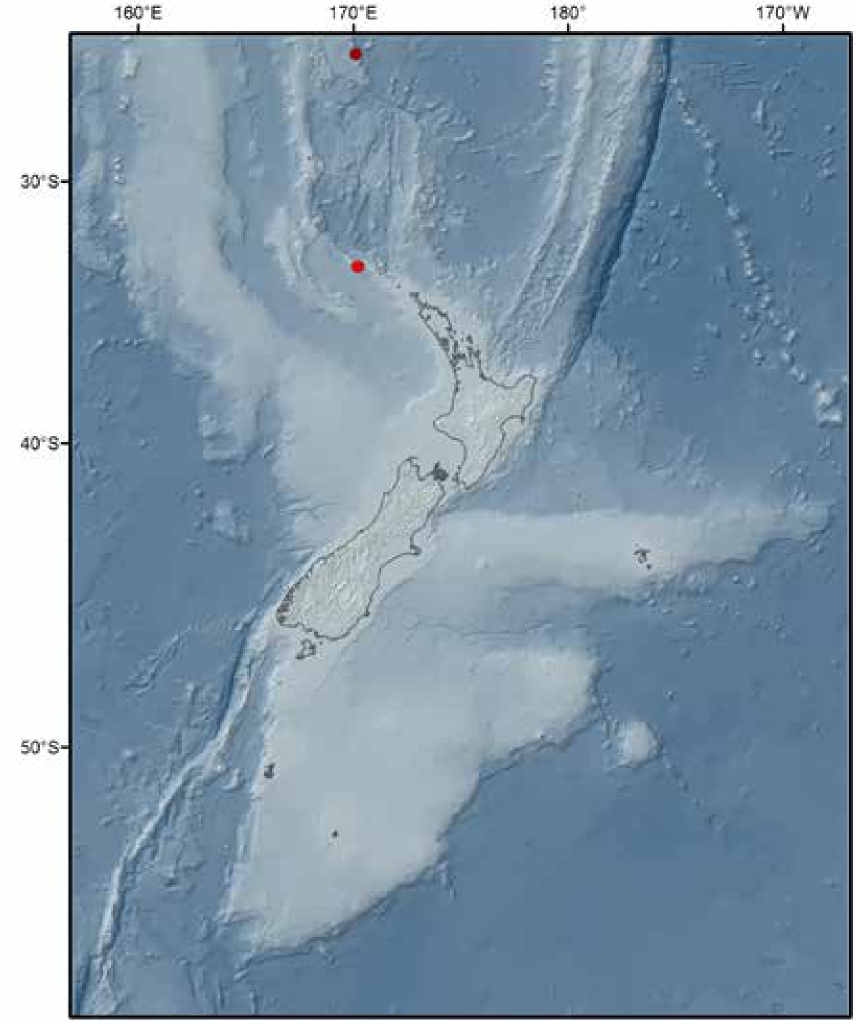


Figure 142. *Uroptychus plumella* Baba, 2018, male, NMNZ CR.022690, NORFANZ Stn TAN0308/133: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left and right Mxp3; **H.** left cheliped, dorsal, showing akentrogonid rhizocephala; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, P3, lateral. Scale bars = 2 mm.

Figure 143. Distribution of *Uroptychus plumella* Baba, 2018 around New Zealand. The northern point shows the holotype record (Baba 2018).



Uroptychus senticarpus. This character might need to be used with caution and whether it is indeed constant should be examined in more detail across a range of specimens. *Uroptychus senticarpus* has so far not been found in the New Zealand region but its distribution on the Norfolk Ridge makes it likely that its range reaches into northern New Zealand.

Among New Zealand species, *U. plumella* is most similar to *U. laperousazi* Ahyong & Poore, 2004, *U. proberti* **sp. nov.** and *U. torrancei* **sp. nov.**; the differences are discussed under those respective species.

Notably, the CO1 sequence derived from one specimen of *U. plumella* (NMNZ CR.022691) does not align with the group of species that all share the V-shaped anterior sternite margin and the prominent distal spine on the P2–4 dactyli (from *U. longvae* to *U. torrancei* **sp. nov.** in the key to the species). The other representatives of that group that were available for sequencing formed a clade (*U. longvae*, *U. macquariae*, *U. megistos,* and *U. torrancei*) (Fig. 5).

Akentrogonid rhizocephalans are attached to the chelipeds and walking legs of both the female (NMNZ CR.022691) and a male (NMNZ CR.022690) (see Fig. 141).

DNA sequence data. Interspecific sequence divergences for partial CO1 gene: > 15%.

Uroptychus politus (Henderson, 1885)

Figs 144, 145

Diptychus politus Henderson, 1885: 420.

Uroptychus politus, Henderson 1888: 178, pl. 6: figs 2a, b; Thomson 1899: 196 (list); Baba 1974: 387, fig. 5; Baba 2005: 219 (key), 230 (list); Baba *et al*. 2008: 40 (list and synonymies); Schnabel 2009a: 564; Schnabel 2009b: 30 (list); Webber *et al*. 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list); Baba 2018: 407, figs 201, 202.

Type & locality. Syntypes—NHMUK 1888:33, H.M.S. *Challenger* Stn 171, 28°33.00′S, 177°50.00′W, Kermadec Islands, 1098 m, 15 Jul 1874, 1 female ov. (cl 7.2 mm).

Distribution. Kermadec Islands (Fig. 145), Solomon Islands, and Loyalty Islands, 897–1240 m.

Habitat. Unknown.

Diagnosis. Carapace distinctly longer than broad, smooth and unarmed on dorsal surface; lateral margin unarmed, convexly divergent posteriorly; anterolateral spine relatively small, distinctly posterior to lateral orbital spine. Rostrum narrow triangular. Pterygostomian flap anteriorly rounded, with or

Figure 144. *Uroptychus politus* (Henderson, 1885), holotype female, NHMUK 1888.33: **A.** carapace and abdomen, dorsal, setae omitted; **B.** carapace and abdomen, lateral; **C.** telson; **D.** sternal plastron; **E.** antennae, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** ventromesial cutting edge of left Mxp3; **H.** right cheliped, dorsal, setae omitted; **I, J.** left chelipeds, dorsal; **K.** right cheliped, mesial; **L–M.** detached right pereopods; **N–O.** detached left pereopods; **P.** dactylus and distal portion of propodus of right pereopod (**L**), lateral. Scale bars = 2 mm.

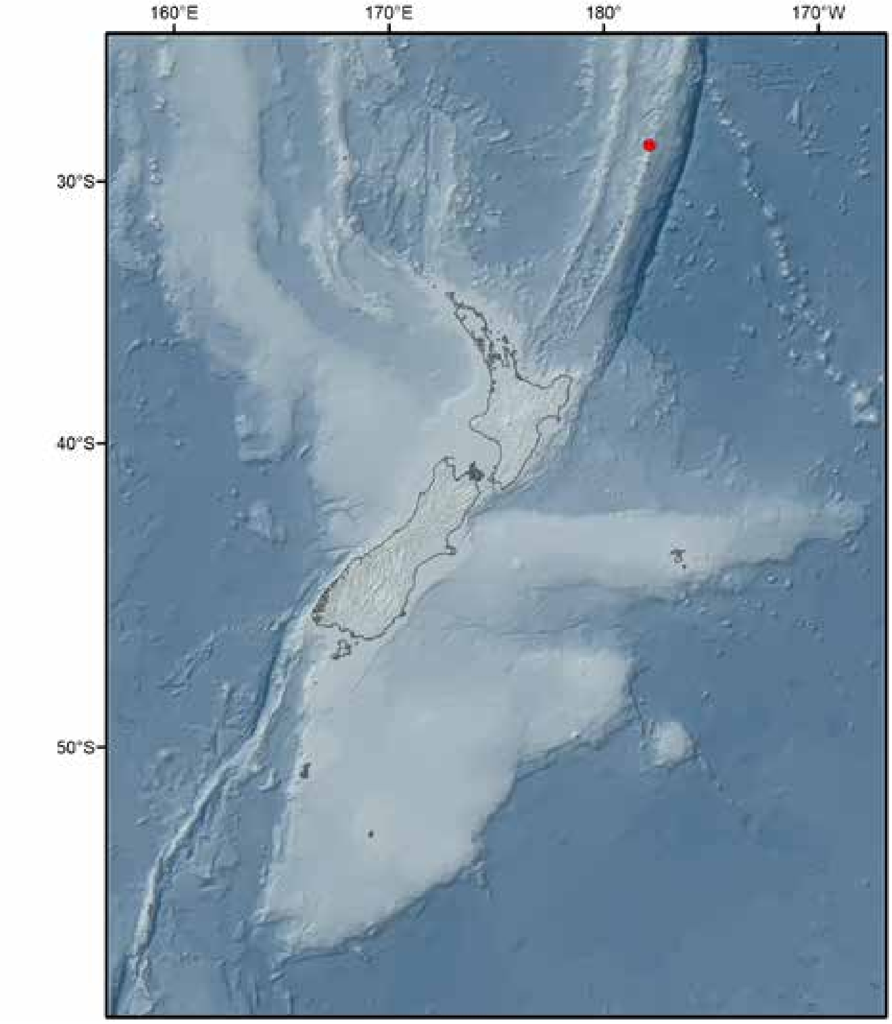


Figure 145. Distribution of *Uroptychus politus* (Henderson, 1885) around New Zealand.

without small spine. Sternal plastron approximately as long as broad; sternite 3 anterior margin moderately concave with small median notch flanked by submedian spines; sternite 4 smooth on ventral surface, anteriorly ending in tooth, not reaching anterior end of sternite 3; sternite 5 with feebly convex or nearly straight anterolateral margin. Abdomen smooth and unarmed. Antenna slender, articles 4 and 5 unarmed; antennal scale not reaching beyond midlength of article 5. Ischium of Mxp3 mesial ridge with mostly obsolescent denticles; other articles unarmed. Cheliped 3 × as long as carapace; merus and carpus with pair of stout ventrodistal spines, ischium with small distodorsal spine, unarmed ventrally. Pereopods 2–4 meri and carpi smooth dorsally; propodi with nearly straight flexor margin bearing pair of terminal spines preceded by row of 5–7 spines along distal half to two-thirds; dactyli without fringe of plumose setae, with sharp triangular spines on flexor margin, ultimate and penultimate subequal in size, distinctly remote from proximal group.

Colour in life. Not known.

Remarks. Henderson (1885) provided the measurements of a single male syntype of *U. politus* from the H.M.S. *Challenger* Station 171 north of the Kermadec Islands, but included an ovigerous female and the smaller male in his more detailed description in the 1888 Challenger report. Of these syntypes, only the female body, three chelipeds (two left and one right) and four walking legs (two left and two right) remain, and it is unclear which appendage was associated with which specimen. Baba (2018) suggested that the complete pair of chelipeds belongs to the male syntype since they are slightly more massive than the remaining left cheliped and reported four additional specimens of this species from the Solomon and Loyalty Islands. No additional material of *U. politus* has been collected in the New Zealand region since the original samples were collected in 1874.

A key diagnostic character of *U. politus* is the unusual shape of the sternite 5 which has the anterolateral margin weakly convex instead of distinctly convex as in most of the other known species. Other distinguishing characteristics compared to species that may easily be confused with *U. politus* are that the two distal spines of the P2–4 propodi are paired (a single spine in both *U. nigricapillis* and *U. terminalis*), the antennal scale barely reaching the midlength of antennal article 5 (it overreaches the peduncle e.g. in *U. empheres* or *U. litosus* and nearly reaches its distal end in *U. australis*, *U. terminalis* and *U. nigricapillis*); the entire dorsal carapace surface is unarmed (some distinct spines, at least in the epigastric region, are present in *U. australis*, U. *terminalis,* and *U. bicavus*), the anterior pterygostomian flap is rounded and with only a small spine at most (most species have a distinct anterior spine, e.g. *U. australis*, *U. terminalis*, *U. litosus,* and *U. inermis*), and the anterolateral carapace spine is small, barely reaching the level of the lateral orbital spine (it is prominent and overreaches the lateral orbital spine in *U. inermis* and *U. litosus*) (Fig. 144).

Two rhizocephalan externae are situated under the female abdomen.

Uroptychus proberti sp. nov. Figs 146, 147

Material examined. Holotype NMNZ CR.025237, NZOI Stn F874, 37°17.0′S, 178°11.0′E, north of East Cape, 1357 m, 03 Oct 1968, female ov. (11.1 mm, pcl 8.0 mm). **Paratype** *North of East Cape*: NMNZ CR.025238, locality details same as for holotype, 1 male (7.1 mm, pcl 4.9 mm).

Type locality. North of East Cape, 1357 m

Distribution. Known only from type locality (Fig. 147).

Habitat. No indications of associations remain with these specimens, but a number of large black corals (*Bathypathes patula*) and different chrysogorgiid gold corals were collected at the same station.

Diagnosis. Carapace wider than long; unarmed on dorsal surface, covered with long, fine setae; lateral margin with distinct anterior branchial spine and less distinct serration along posterior branchial margin, anterolateral spine overreaching small lateral orbital spine. Rostrum narrow triangular; lateral margins smooth. Anterior margin of thoracic sternite 3 shallow concave with slight median notch, without submedian spines. Antennal peduncle unarmed on distal two articles; antennal scale not reaching end of peduncle. P2–4 propodi without marked projection on flexor margin; with 3–0 (from P2 to P4) spines along margin in addition to paired terminal spines; dactyli distally tapering, with 8 or 9 long and sharp spines, distal group subequal in size, directed nearly perpendicular to margin.

Description. Carapace: pcl 1.2 × width, moderately convex from side to side. Dorsal surface covered with thick long setae, unarmed; cervical groove indistinct (faintly indicated). Lateral orbital spine small. Anterolateral spine well-developed, overreaching lateral orbital spine; lateral margins convexly divergent posteriorly; with 7 small spines or granules excluding anterolateral spine: 2 granules on hepatic margin, 1 larger anterior branchial spine, 4 large granules on posterior branchial margin; anterior branchial spine largest. Posterolateral margin not ridged. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines), horizontal, 0.4 × pcl; dorsal surface covered with fine setae; lateral margins smooth. Pterygostomian flap surface smooth; anterior margin produced into spine.

Thoracic sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron very wide, nearly 2 × as wide as long, strongly widening posteriorly; surface smooth. Sternite 3 anterolaterally rounded; anterior margin with wide, U-shaped excavation; with slight indication of median notch only, submedian spines absent. Sternite 4 over 2 × as wide as sternite 3, anteriorly shallow concave, midline barely grooved; anterolateral margin rounded with blunt terminus, longer than posterolateral margin; mesially with small spine; laterallly unarmed.

Abdomen: Tergites unarmed and without ridges; covered with short, fine, scattered setae. Pleural margins of somites 2–4 rounded. Telson 1.9 × as broad as long; posterior margin emarginated; posterior portion 1.7 × length of anterior portion.

Eyes: Smooth. Cornea subglobular, 0.3 × length of ocular peduncle.

Antennal peduncle: Article 2 without distal spines. Article 3 unarmed. Articles 4 and 5 unarmed distally and mesially; article 4 1.5 × as long as article 5. Antennal scale nearly reaching end of article 5; nearly 4 × as long as wide.

Maxilliped 3: Coxa unarmed. Basis smooth along mesial ridge. Ischium distally unarmed; crista dentata with 13 denticles distally continued to fine serrations. Merus extensor margin with small distal spine; flexor margin with two small spines distal to midlength. Carpus with small proximal spine on extensor margin, otherwise unarmed.

Cheliped: Elongate; 3.2 × pcl; surface moderately setose. Ischium with dorsal distal spine; ventrally unarmed. Merus, surface covered with setiferous tubercles; with six distal spines. Carpus surface sparsely tuberculate; with six distal spines; length 0.8 × that of palm. Palm 4 × as long as wide, unarmed and sparsely covered with long setae. Dactylus length 0.4 × as long as propodus; occlusal margins denticulate, with slight gape.

Pereopods 2–4: Similar; surface setose. Merus dorsally smooth; ventral margin with distal spine on P2–P3 only, distally rounded on P4; 1.1–0.8 × as long as propodus, P4 merus two-third length of P2 merus.

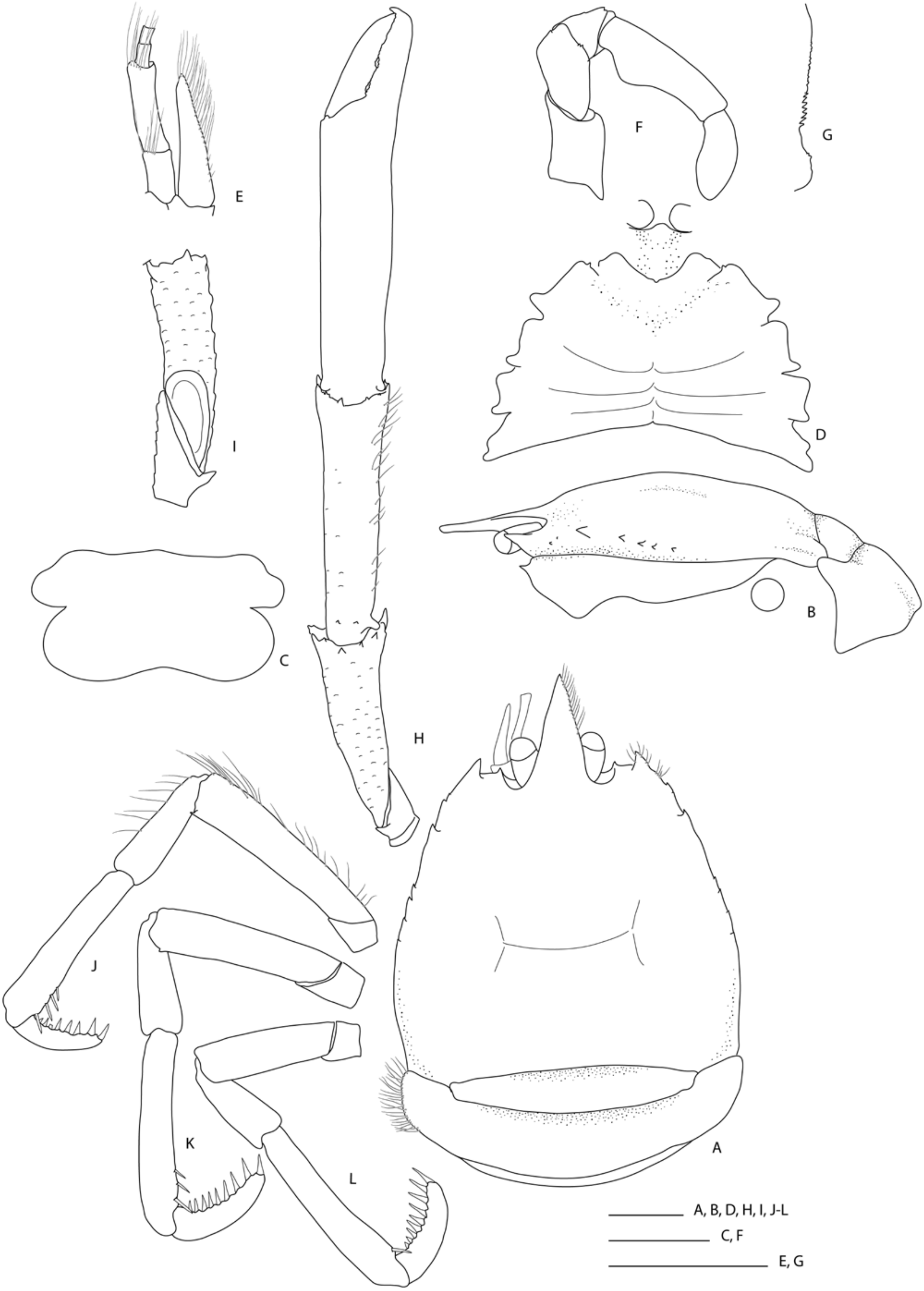
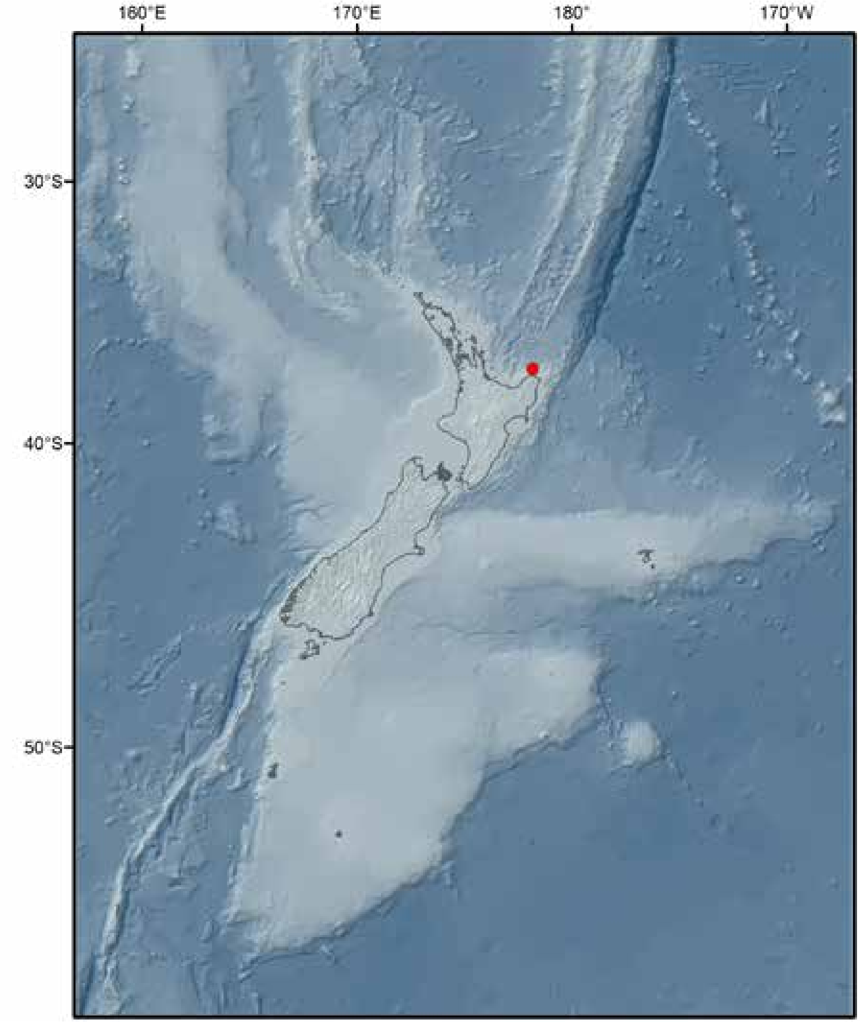


Figure 146. *Uroptychus proberti* **sp. nov.**, holotype, female ov., NMNZ CR.025237: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** telson; **D.** excavated sternum and sternal plastron; **E.** antenna, left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of right Mxp3; **H.** right cheliped, dorsal; **I.** right cheliped, ischium and merus, lateral; **J–L.** left P2–4, lateral. Scale bars = 2 mm.

Figure 147. Distribution of *Uroptychus proberti* **sp. nov.** around New Zealand.



Carpus unarmed. Propodus 5.3–5.6 × longer than wide; extensor margin smooth; flexor margin not inflated distally, with distal pair of spines preceded by 2 or 3 spines along distal quarter on P2–P3; distal spines only on P4; 1.6–1.7 × as long as dactylus. Dactylus gently curved; flexor margin with 9 or 10 sharp triangular spines, all nearly perpendicular to margin and loosely and regularly arranged along entire length; distal 4 spines subequal in size.

Ovum. Holotype with 20 eggs, ~1.2 mm diameter.

Colour in life. Not known.

Etymology. Named after Keith Probert, retired Associate Professor at the Marine Science Department of the University of Otago in Dunedin, acknowledging his contributions to New Zealand marine science and with thanks for his mentorship.

Remarks. The holotype of *U. proberti* **sp. nov.** is the larger ovigerous female of two specimens collected from a single station off East Cape (North Island) (Fig. 147). These specimens have been previously examined and have been damaged: the male has all legs detached; the female is missing the left antennal peduncle and the abdomen is detached at the abdominal tergite 2. The specimens, however, agree in most morphological respects. Small variation is evident in the male legs being stouter than those of the female; the female propodi are 5.3–5.6 × as wide as long, while in the male they are about five times longer than wide. The propodal flexor margin of the P3 has two additional spines proximal to the distal pair in the female (with distal pair only in the male), and the P2 has three (female) and two (male) additional spines (Fig. 146).

Uroptychus proberti **sp. nov.** belongs to a group of species that have a broad carapace, a sternum that is anteriorly excavated and lacking a distinct median notch and submedian spines, the walking leg propodi with a flexor margin that bears spines (at least on P2), and the dactyli have the distal group of spines all prominent and subequal in size. This includes *U. latus* Ahyong & Poore, 2004 and *U. laperousazi* Ahyong & Poore, 2004, from southern Australia, *U. plumella* Baba, 2018 from New Caledonia, and *U. torrancei* **sp. nov.** (*U. laperousazi* and *U. plumella* are also reported from New Zealand, see above). These differ primarily in having the carapace lateral margin, other than the anterolateral spine, smooth instead of having a distinct anterior branchial spine, and in having both antennal articles 4 and 5 distally with a spine instead of unarmed.

Uroptychus magnispinatus Baba, 1977a from Hawaii has spines along the lateral carapace margin and on the distal margin of the cheliped meri and carpi; however, it differs from *U. proberti* **sp. nov.** in having nearly subparallel lateral carapace margins (strongly convexly divergent), in having the antennal scale overreaching the peduncle (versus not reaching the end of the peduncle) and the Mxp3 meri and carpi each with a distinct distolateral spine (versus minute spines).

ZooBank registration. *Uroptychus proberti* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:60A3948C-6501-40A0-8CE5-D8D17975220D.

Uroptychus raymondi Baba, 2000 Figs 148, 149

Uroptychus raymondi Baba, 2000: 250, fig. 3; Davie 2002: 31 (no record); Ahyong & Poore 2004: 73, fig. 22; Poore 2004: 226, fig. 62c (compilation); Baba 2005: 230 (synonymies, key); Baba *et al.* 2008: 40 (list and synonymies); Schnabel 2009b: 30 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list); Baba 2018: 443.

Type & locality (not examined). Holotype—TMAG G3517, 41°25′S, 148°40′E, off St Helens, Tasmania, 645 m, female ov. (pcl 6.4 mm).

Material examined. *Lord Howe Rise (International Waters)*: AKM MA8510, 36°22′S, 164°49′E, 963–917 m, 19 Jul 1990, 1 female ov. (10.3 mm, pcl 6.5 mm), 2 males (broken rostrum, 8.1, pcl 5.5, 4.8 mm).

Southern Kermadec Ridge, Clark Seamount: NIWA 82866, NIWA Stn TAN1206/95, 36°27.07–26.93′S, 177°50.39–50.38′E, 840–872 m, 24 Apr 2012, 1 female ov. (12.5 mm, pcl 8.6 mm), 1 male (broken carapace).

Chatham Rise: NMNZ CR.016869, SOP Stn 2101/110, 42°52′S, 176°56′W, 717–859 m, 11 Jun 2005, 4 females ov. (12.0 mm, rostrum broken, pcl 9.0, 9.0, 8.2 mm, broken carapace), 2 males (12.5, 11.6 mm, pcl 8.4, 7.6 mm).

Chatham Rise, Graveyard Seamount Complex, Zombie Hill: NIWA 26448, NIWA Stn TAN0604/9, 42°45.76–45.45′S, 179°55.51–55.36′W, 1019–1081, 28 May 2006, 1 female (11.6 mm, pcl 7.6 mm); NIWA 26447, NIWA TAN0604/10, 42°45.92–45.82′S, 179°55.69–56.22′W, 1005–1082, 28 May 2006, 1 male (9.7 mm, pcl 6.2 mm); NIWA 23075, NIWA Stn TAN0104/336, 42°46.07′S, 179°55.31′W, 955–890 m, 20 Apr 2001, 1 female ov. (12.8 mm, pcl 8.3 mm); NIWA 23153, TAN0104/198, 42°45.92′S, 179°55.62′E, 1058 m, 18 Apr 2001, 1 male (10.5 mm, pcl 7.4 mm).

Chatham Rise, Graveyard Seamount Complex, Graveyard Seamount: NIWA 23156, NIWA Stn TAN0104/2, 42°45.93–46.12′S, 179°59.34–59.31′W, 875–757.0, 15 Apr 2001, 1 female (6.5 mm, pcl 4.3 mm).

Chatham Rise, Graveyard Seamount Complex, Dead Ringer Seamount: NIWA 53495, NIWA Stn TAN0905/71, 42°44.17–44.17′S, 179°41.41–41.08′W, 820–1023 m, 22 Jun 2009, 1 female (9.3 mm, pcl 6.3 mm), 1 male (7.6 mm, pcl 5.0 mm).

Chatham Rise, Andes Seamount Complex: NIWA 23079, NIWA Stn TAN0104/48, 42°47.17′S, 179°59.12′W, Diabolical Seamount, 993–900 m, 16 Apr 2001, 2 males (16.6, 7.7 mm, 11.1, 5.2 mm); NIWA 23154, NIWA Stn TAN0104/113, 42°47.47′S, 179°59.33′W, Diabolical Seamount, 900–1000 m, 17 Apr 2001, 1 female ov. (12.0 mm, pcl 8.4 mm); NIWA 23078, NIWA Stn TAN0104/47, 42°47.57 S, 179°58.86 W, 950–900.0, 16 Apr 2001, 1 female (12.4 mm, pcl 8.5 mm), 2 males (12.4 mm, pcl 8.1 mm, broken carapace); NIWA 60514, NIWA Stn TAN0905/99, 44°08.38–08.54′S, 174°43.18–43.56′W, Diamondhead Seamount, 641–758 m, 26 Jun 2009, 1 male (11.1 mm, pcl 7.3 mm); NIWA 54021, NIWA Stn TAN0905/112, 44°08.57–08.82′S, 174°43.49–43.52′W, Diamondhead Peak A, 760–821 m, 27 Jun 2009, 2 females ov. (12.8, 11.5 mm, pcl 8.7, 8.0 mm; larger female ov. sequenced, see Fig. 5) 1 female (10.9 mm, pcl 7.5 mm); NIWA 54198, NIWA Stn TAN0905/116, 44°10.50–10.39′S, 174°33.13–33.36′W, Ritchie Hill Summit, 716–745 m, 27 Jun 2009, 2 females (12.0, 7.2 mm, pcl 8.3, 4.7 mm), 2 males (11.9 mm, broken rostrum, pcl 7.7, 7.6 mm).

Subantarctic New Zealand, west of Snares Island: NIWA 23126, SOP Stn 1171/22 - Z9587, 48°0′S, 166°05′E, 943 m, 27 Nov 1998, 1 female ov. (15.1 mm, pcl 11.4 mm).

Distribution. Tasmania, Victoria, 644–650 m (Baba 2000; Ahyong & Poore 2004); Norfolk Ridge, 759–807 m; Lord Hose Rise, Kermadec Ridge, Chatham Rise seamounts, 641–1082 m (Fig. 149).

Habitat. Primarily collected from seamounts, and a collection note (NIWA 23126) indicates a possible association with hard coral *Enallopsammia*.

Diagnosis. Carapace excluding rostrum slightly broader than long; dorsal surface unarmed, setose and sparsely tuberculate; anterolateral spine stout; lateral orbital angle rounded or acute, far falling short of tip of anterolateral spine; lateral margins convex, irregularly tuberculate, with prominent spine at midlength. Rostrum narrow (width < 0.5 × distance between anterolateral spines at base). Sternite 3 depressed, anterior margin deeply concave, with U-shaped median notch, with or without pair or obsolescent submedian spines. Sternite 4 anterolateral margin as long as posterolateral margin. Antennal flagellum short, not reaching end of cheliped merus. P2–4 propodi with

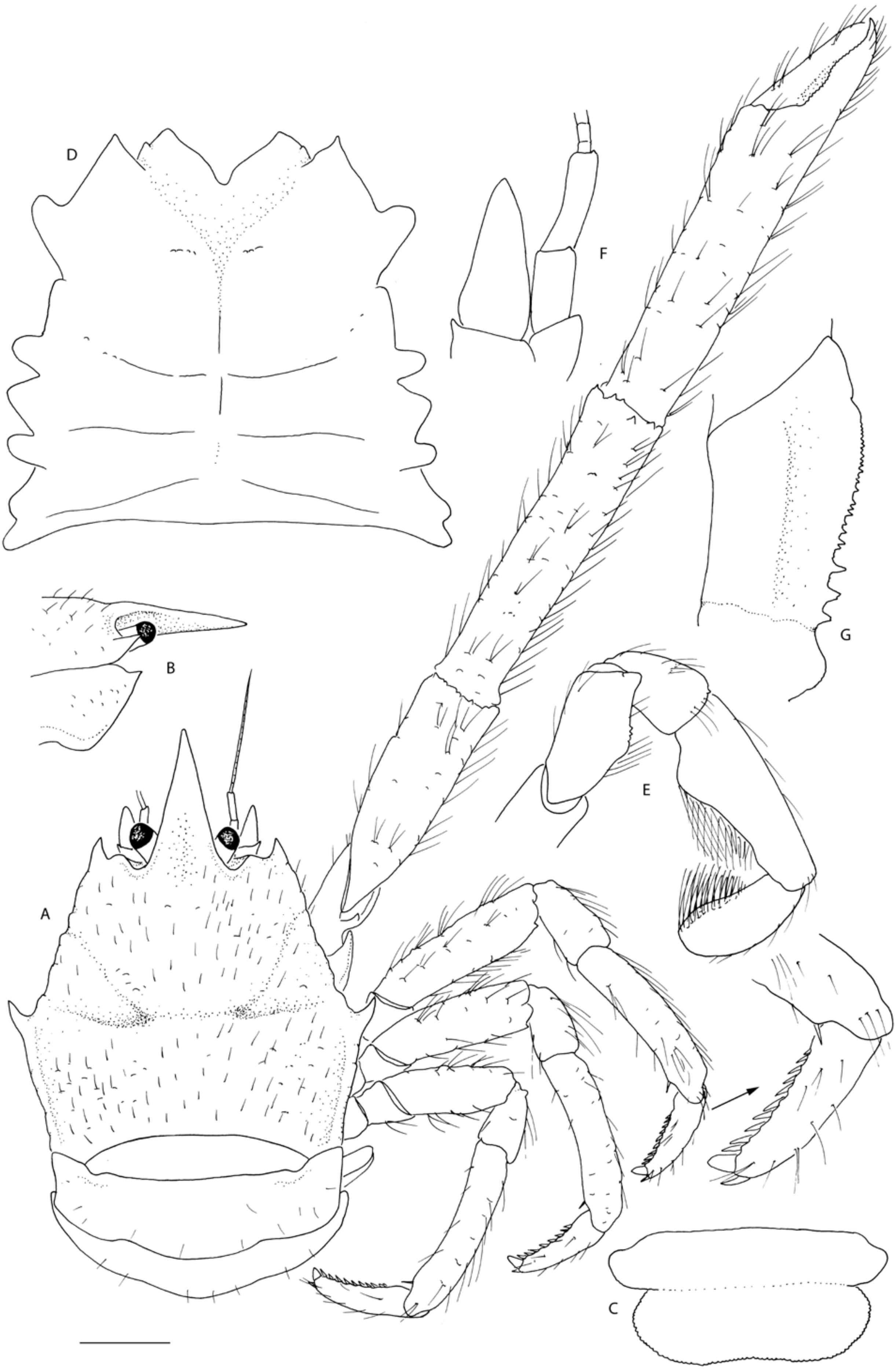
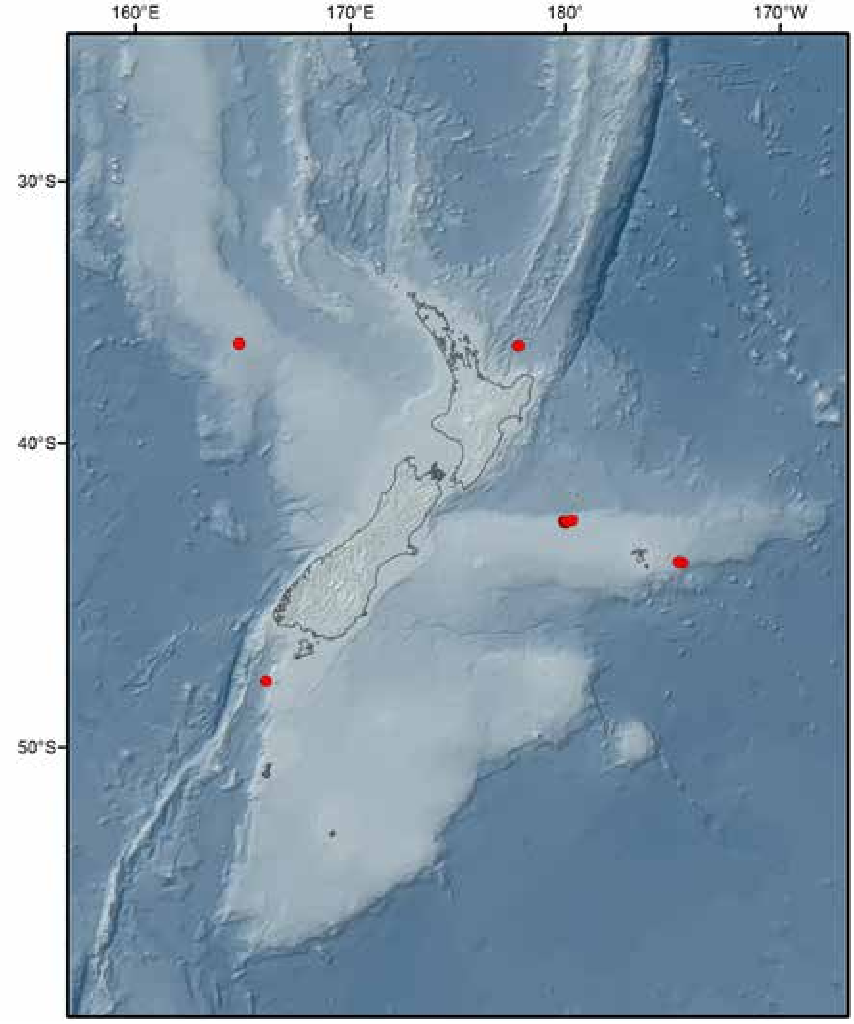


Figure 148. *Uroptychus raymondi* Baba, 2000, female, cl 13.7 mm, Tasmania, SAM C6086: **A.** dorsal habitus; **B.** anterior carapace, right lateral; **C.** telson; **D.** sternum; **E.** Mxp3, right lateral; **F.** antenna, right ventral; **G.** crista dentata, right. A–B = 3 mm, C–F = 1.5 mm, G = 0.8 mm. After Ahyong & Poore (2004).

Figure 149. Distribution of *Uroptychus raymondi* Baba, 2000 around New Zealand.



pair of movable spines on distal flexor margin only; dactyli distally tapering, with 10–13 slender, obliquely angled, closely arranged spines along flexor margin; penultimate spine much broader than both ultimate and antepenultimate.

Colour in life. Not recorded.

Remarks. *Uroptychus raymondi* is one of the more abundant and widespread species in the New Zealand region with a total of 34 specimens collected from the Lord Howe Rise to the Snares.

The specimens of *U. raymondi* reported here extend the known size range. To date, the largest known specimen was an ovigerous female (cl 13.7 mm, SAM C6086, Ahyong & Poore 2004, Fig. 148). The largest specimens examined here are a male (NIWA 23079) at 16.6 mm (pcl 11.1 mm) and an ovigerous female (NIWA 23126) at cl 15.1 mm (pcl 11.4 mm). The larger specimens are increasingly granular and tuberculate, including the carapace, pterygostomian flap, and pereopods. The cheliped can bear large tubercles and spines on the merus, particularly on the mesial surfaces, and along the distal margins of the meri and carpi, which can be more pronounced than illustrated by both Baba (2000) and Ahyong & Poore (2004). Other notable variation includes the shape of the anterior margins of thoracic sternites 3 and 4; they are typically angular or acute and they can be furnished with one or two distinct tubercles or minutely serrate along the lateral margins. The median notch of sternite 3 is often indistinct, rounded or V-shaped, and submedian spines are present in nearly all specimens, although small or obsolescent in most. The antennal peduncle has articles 4 and 5 each bearing a small distolateral spine. The spine on the article 4 is always visible; in a few specimens the article has two small distal spines laterally (e.g. NIWA 54198, male, 11.9 mm) and the spine on article 5 is small or obsolescent (NIWA 23079, male, 7.7 mm). The antennal scale typically reaches to the midlength of the antennal article 5, but is shorter (just overreaching article 4, NIWA 23078) or longer (nearly reaching the end of article 5, NIWA 54021). The Mxp3 occasionally bears a more distinct spine on the distal angle of the merus extensor margin than illustrated previously, and the flexor margin often bears a number of more or less distinct tubercles at mid length. The carpus always bears a distal and sometimes one or two proximal tubercles, larger than previously illustrated.

Uroptychus raymondi is unique in its distinctive carapace shape, which appears nearly hexagonal (particularly in large specimens), together with the distinct lateral spine at approximately midlength. Also pronounced in large specimens is the sculpture of the dorsal carapace surface with the cervical and postcervical groove more distinct than typically observed in its congeners. No other Australasian species shares this carapace shape and it is easy to identify, but it may be closely related to *U. valdiviae* Balss, 1913 from the Nicobar Islands in the Andaman Sea, sharing the overall morphology of the cheliped and walking legs and bears a single spine at approximately midlength of the lateral carapace margin. The type specimens of *U. valdiviae* remain the only available material, and the figure of the dorsal habitus (Doflein & Balss 1913: fig. 4) does not illustrate many characters that are used today; these remain to be verified (Baba 2000). It appears that the carapace is less 'hexagonal', with the lateral spine less prominent in *U. valdiviae* than in *U. raymondi*. Baba (2018) suggested that the length of the antennal flagellum separates the two species (extending far beyond end of cheliped merus in *U. valdiviae* and barely reaching end of cheliped merus in *U. raymondi*).

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 1.1% (NIWA 54021 compared to a sequence derived from a specimen collected on the flanks of the Cascade Seamount, East Tasman Plateau, 1061 m, NMV J60610, N. Andreakis pers.comm.). Interspecific sequence divergences for partial CO1 gene: > 15%.

Uroptychus remotispinatus Baba & Tirmizi, 1979

Figs 150–152

Uroptychus gracilimanus Doflein & Balss, 1913: 134 (part) [not *U. gracilimanus* (Henderson, 1885)].

Uroptychus remotispinatus Baba & Tirmizi, 1979: 52, figs 1, 2, 1320–1600 m; Baba 1990: 947; Baba 2005: 55, 230 (synonymies, key); Baba *et al.* 2008: 41 (list and synonymies); Baba *et al.* 2009: 57, figs 47–48; Poore *et al.* 2011: 329, pl. 7H; Baba 2018: 444, fig. 222.

Material examined. Holotype—USNM 150318, 32°32′N, 132°25′E, Bungo Strait between Kyushu and Shikoku, Japan, 1320 m, female ov. (12.1 mm, pcl 8.6 mm).

Other material. *Colville Ridge*: NIWA 24580, NZOI Stn X174, 36°26.83′S, 176°51.56′E, 1800 m, 02 Dec 1989, 1 female ov. (10.0 mm, pcl 7.5 mm), 1 male (10.0 mm, pcl 7.7 mm).

Bay of Plenty: NIWA 82096, NIWA Stn TAN1206/15, 36°55.44–55.15′S, 176°58.78–58.75′E, 1502–1493 m, 16 Apr 2012, 1 female ov. (8.9 mm, pcl 7.1 mm). NIWA 9008, NIWA Stn TAN0413/42, 36°55.65–55.98′S, 177°20.29–20.31′E, Otara Seamount, 1518–1440 m, 10 Nov 2004, 1 female ov. (9.6 mm, pcl 7.7 mm). NIWA 9009, NIWA Stn TAN0413/41, 36°56.81–57.09′S, 177°20.09–19.90′E, Otara Seamount, 1323–1346 m, 10 Nov 2004, 1 female ov. (9.9 mm, pcl 8.1 mm; sequenced, see Fig. 5). NIWA 9010, NIWA Stn TAN0413/39, 36°57.39–57.36′S, 177°20.58–20.76′E, Otara Seamount, 1099–1073 m, 9 Nov 204, 1 female (10.5 mm, pcl 7.9 mm). NIWA 9012, NIWA Stn TAN0413/35, 36°57.57–57.69′S, 177°19.92–19.54′E, Otara Seamount, 1396–1462 m, 09 Nov 2004, 1 female ov. (carapace broken; sequenced, see Fig. 5). NIWA 83432, NIWA Stn TAN1206/172, 37°09.48–09.42′S, 176°59.37–59.1′E, Matatara Knoll, 1457–1482 m, 30 Apr 2012, 2 females ov. (9.8, 9.1 mm, pcl 7.2, 6.9 mm), 1 male (11.1 mm, pcl 8.1 mm; sequenced, see Fig. 5), "picked off *Acanella*". NIWA 85227, NIWA Stn TAN1206/176, 37°15.58–15.68′S, 178°0.96–0.76′E, 1540–1497 m, 01 May 2012, 1 male (9.5 mm, pcl 7.2 mm), "pulled off *Acanella*". NIWA 82657, NIWA Stn TAN1206/73, 37°18.10–18.13′S, 177°52.10–52.38′E, 1446–1504 m, 21 Apr 2012, 1 female ov. (10.6 mm, pcl 8.2 mm). NMNZ CR.025240, NZOI Stn F897, 36°40.50′S, 176°24.00′E, 1306–1141 m, 1968 Oct 06, 1 male (7.0 mm, pcl 5.1 mm). NMNZ CR.025239, NZOI Stn R51, 37°22.20′S, 177°22.00′E, 1343–1378 m, 18 Jan 1979, 1 female ov. (10.0 mm, pcl 8.0 mm), 1 male (11.0 mm, pcl 8.4 mm), on *Acanella*.

Status uncertain. *Uroptychus* cf. *remotispinatus*: NIWA 72238, NIWA Stn TAN1104/19, 36°28.57–28.37′S, 177°53.51–53.43′E, Clark Seamount, Kermadec Ridge, 1460–1456 m, 03 Mar 2011, 1 male (6.7 mm, pcl 4.4 mm; sequenced, see Fig. 5), "on *Chrysogorgia*".

Type locality. Bungo Strait between Kyushu and Shikoku, Japan, 1320 m.

Distribution. Indo-West Pacific, from South Africa, Mozambique, Madagascar, Makassar Strait, Japan, Loyalty Islands, 850–2175 m; Colville Ridge and Bay of Plenty, 1073–1800 m (Fig. 152).

Habitat. *Uroptychus remotispinatus* is commonly associated with small bushy bamboo corals of the genus *Acanella*. NMNZ CR.025239 was extracted from a preserved coral for examination. Collection notes for specimen NIWA 83432 indicate they were collected from within the matrix of an *Acanella*, and small pieces of bamboo corals retained with other specimen jars make it likely that this species may be associated with octocorals. This is also in accordance with reports provided by Baba (2018).

Diagnosis. Carapace (pcl) about as long as broad, smooth on dorsal surface; lateral margin without distinct spine, other than anterolateral spine. Rostrum narrow triangular, ranging from short (barely

Figure 150. Live coloration of *Uroptychus remotispinatus* Baba & Tirmizi, 1979, NIWA 83432, Stn TAN1206/172. Image courtesy of Rob Stewart, NIWA.

overreaching ocular peduncles, 0.3 × pcl) to extending well beyond (around 0.5 × pcl). Antennal peduncle unarmed; article 5 about 1.5 × as long as article 4; antennal scale at least overreaches article 4 but falls short of midlength of article 5, distally round or acute. Mxp3 unarmed. Cheliped carpus longer than palm. P2–4 propodi without convex flexor distal margin; with row of spines, distal-most spine single, remote from juncture between propodus and dactylus, all spines nearly equidistantly arranged. P2 dactylus with 2 distal spines remotely separated from proximal group of spines. P3 and P4 with less apparent gap between distal and proximal groups of spines.

Colour in life. Baba *et al.* (2009) and Poore *et al.* (2011) illustrated a specimen from Taiwan with the description "pale seashell pink base color; reddish on anterior part of carapace including rostrum, Mxp3, cheliped fingers and P2–4 propodi and dactyli. Corneas pale yellowish. Tailfan translucent." This matches the live coloration captured for NIWA 83432 (Fig. 150).

Remarks. The name of the species refers to the distinct gap between the distal pair of spines and the proximal row of spines along the dactylar flexor margin of the walking legs. The type description of *U. remotispinatus*, however, does not note variation in this character, Baba (2018) indicated subsequently that this pattern is consistent only on P2. Specifically, both P3 and P4 may have an additional spine placed between the distal and proximal groups of spines, leaving only a small or no gap along the flexor margin. Re-examination of the holotype from Japan confirmed, firstly, that none of the P2 have been preserved and, secondly, that P3–4 all show the distinct gap. The New Zealand material examined here shows the variable pattern as highlighted by Baba (2018). Only P2 consistently shows the distinct gap which covers approximately a third of the distance of the flexor margin between the distal pair and the proximal row of remaining spines. This gap is progressively lessening in distance from P3 to P4 (Fig. 151M–O). The propodal spination of P2–4 is also unusual in that the distal-most angle of the flexor margin, at the juncture between the propodus and the dactylus, is unarmed. The distal-most spine along the flexor margin is single and considerably remote from the juncture.

Notes and illustrations in the type description (Baba & Tirmizi, 1979; Baba, 2005; 2018) indicate that the rostral length varies in *U. remotispinatus*, with the rostrum being short, about 0.3 × pcl, and barely reaching or over-reaching the ocular peduncle to nearly 0.5 × pcl in the holotype, distinctly over-reaching the rostrum. The material examined here confirms that this character is variable, with the figured specimen (NIWA 9009, Fig. 151) having a rostral length of only 0.2 × the remaining carapace length, and the smallest

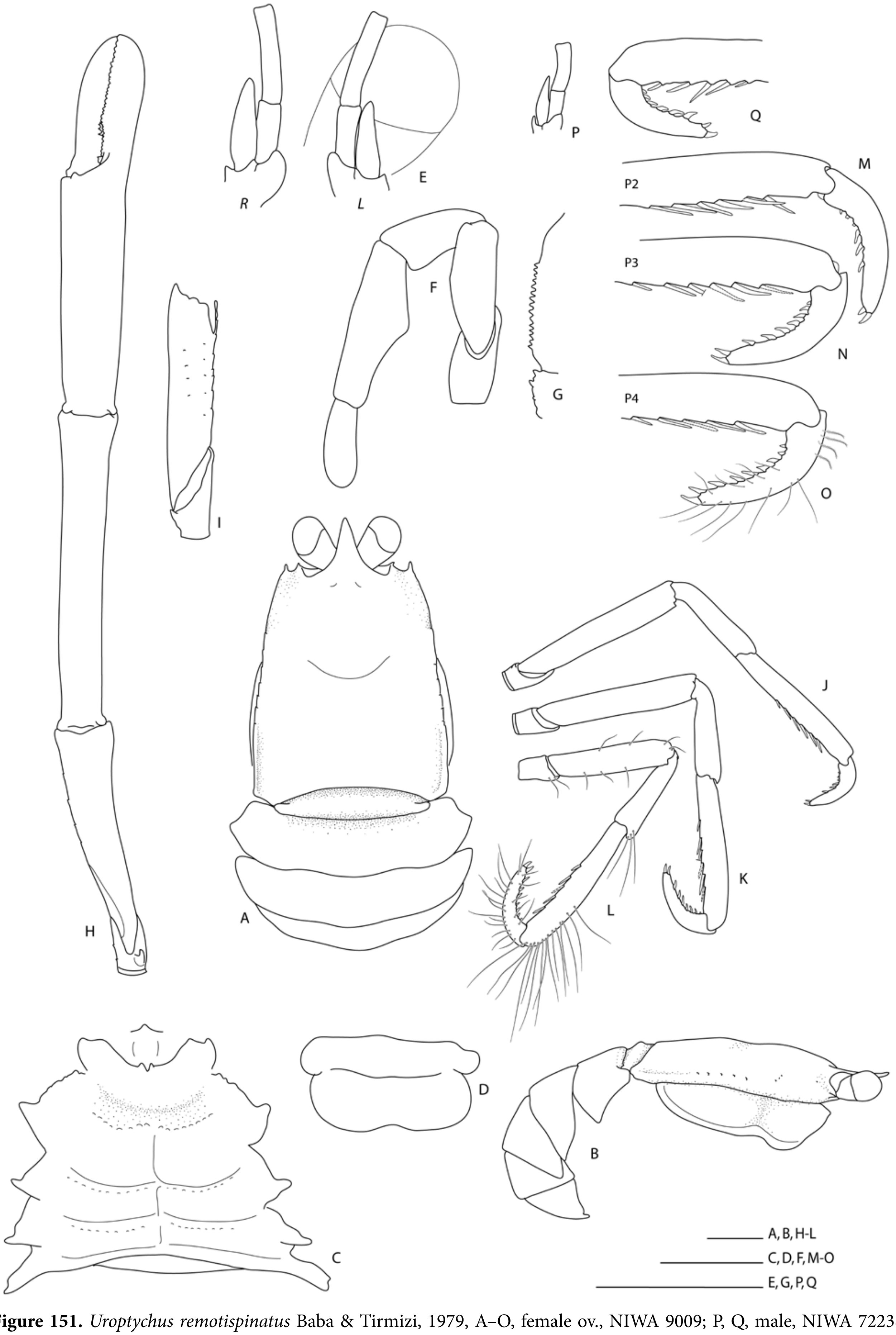
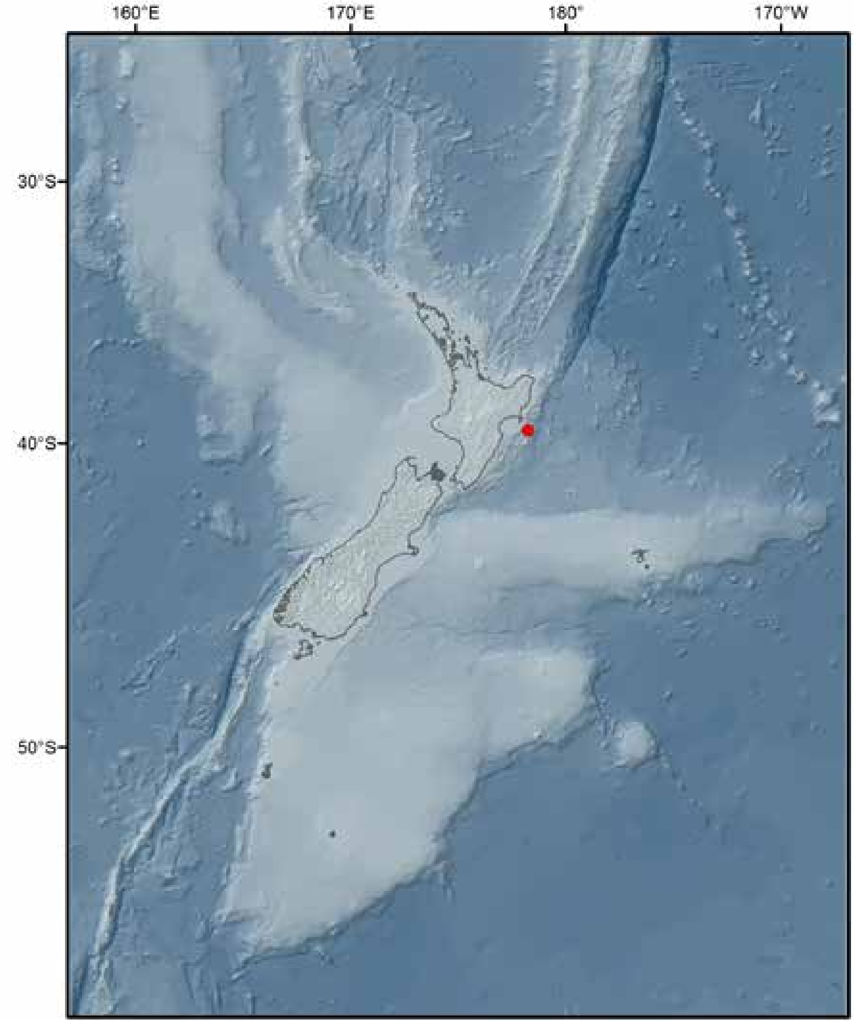


Figure 151. *Uroptychus remotispinatus* Baba & Tirmizi, 1979, A–O, female ov., NIWA 9009; P, Q, male, NIWA 72238: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** sternal plastron; **D.** telson; **E.** antenna, left and right, left ocular peduncle, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata, left; **H.** right cheliped, dorsal; **I.** right cheliped, ischium and merus, mesial; **J–L.** right P2–4; **M–O.** P2–4 propodi and dactyli; **P.** antenna, right; **Q.** P2, left. Scale bars = 2 mm.

Figure 152. Distribution of *Uroptychus remotispinatus* Baba & Tirmizi, 1979 around New Zealand.



specimen (NIWA 72238, male) having a rostrum of nearly 0.5 × pcl. In the majority of the specimens, the rostral length lies around 0.3 × pcl. The antennal scale at least over-reaches antennal article 4 but falls short of the midpoint of the article 5 and the terminus ranges from rounded (as illustrated for holotype and specimen figured here, Fig. 151E) to acute (NMNZ CR.025240, NIWA 9010) or both (NIWA 24580). The cheliped, especially in larger specimens, can be tuberculose on the ventral surfaces of the merus, but some sexual dimorphism is apparent. The cheliped length/carapace length ratio (including the rostrum) is given as 3.6 for the female holotype, and 3.4 for the large female specimen figured here. The largest male examined here (NMNZ CR.025239) has a similar ratio of 3.5, with the fingers gaping considerably. The palm is slightly more robust than in smaller specimens and females, with a width/length ratio of 0.4, compared to 0.3. The number of eggs varies from four to 20 and they are all large, the size ranging from 2.0 to 2.5 mm in diameter.

The New Zealand material of *U. remotispinatus* matches the original descriptions well in nearly all other aspects. The description of the type material does not illustrate the disto-ventral angle of the cheliped merus. Examination of the holotype shows an angular margin, lacking a distinct spine. The New Zealand material is variable for this character, with a rounded angle (NIWA 9009, Fig. 151I) to a robust pair of spines in the largest male (NMNZ CR.025239).

The smallest specimen (male, NIWA 72238, 4.4 mm) is considered here as *U.* cf. *remotispinatus* based on significant genetic dissimilarity (see below) and needs further investigation. It was collected within close proximity of the other specimens in the southern Bay of Plenty and in most respects aligns with the remaining material examined. However, the morphology of the P2 dactylus does not show the diagnostic features as clearly as can be seen in larger specimens; the pattern is that of a more regular arrangement and aligns more with what is observed on P3 and P4 (see Fig. 151Q). The antennal scale also clearly overreaches article 4 (Fig. 151P) but is not much different from the morphology shown in Fig. 151E. Further examination will have to determine whether these differences are allometric, but this specimen appears to be somewhat intermediate between *U. remotispinatus* and *U. vandamae*, known from Indonesia to the Solomon Islands. This may be enhanced by the information that it was collected from a gold coral (*Chrysogorgia*), which appears to be atypical for *U. remotispinatus* (see comments above) and might be more typical of *U. vandamae* (Baba 2018). DNA sequence data indicates that this specimen might indeed represent a close relative with sequence divergence for CO1 around 5% (see below).

Uroptychus remotispinatus belongs to the species with a smooth and unarmed carapace, a rostrum that is narrow (longer than broad), with a row of spines along the flexor margin of the propodi which are not inflated distally. Some of these species that might be considered most similar morphologically include *U. brevisquamatus*, *U. gracilimanus,* and *U. vandamae*, the former also reported for the New Zealand region. *Uroptychus remotispinatus* can be distinguished from *U. brevisquamatus* and *U. gracilimanus* by the spination on the P2 dactylus (the distinct gap between the distal pair of spines and the proximal row or spines, which is absent in the others) and the absence of terminal spines on the walking leg propodi (see above). It appears to be most close to *U. vandamae* from Indonesia, which also shares the dactylar spination. However, this species can be further distinguished by the length of the rostrum (more than half the pcl, less than or equal to half in *U. remotispinatus*); the proportion of the length of antennal articles 4 and 5 (article 5 is twice as long as the article 4 in *U. vandamae* and around 1.5 × as long in *U. remotispinatus*); the length of the antennal scale (reaches mid-point of antennal article 5 in *U. vandamae*, usually just over-reaches article 4 but does not reach the mid-point of article 5 in *U. remotispinatus*); and the spination of the P2–4 propodi (*U. vandamae* has the distalmost of the flexor marginal spines less remote from the juncture between propodus and dactylus than in *U. remotispinatus*, and the distal second spine much more or considerably remote from the terminal, while all spines are equidistant in *U. remotispinatus*.

Because of the P2–4 dactylar spination, *U. remotispinatus* is aligned with *U. havre* **sp. nov.** and *U. thermalis* Baba & de Saint Laurent, 1992 in the key. Differences are discussed under the account of *U. thermalis* below.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.2–0.3% (three specimens, NIWA 9009, 9012, 83432), the smallest specimen, considered *U.* cf. *remotispinatus* (see above) differs in about 5% of the basepairs compared to the others. Closest interspecific sequence divergences: ~7.4% (*U. alcocki*), ~8% (*U. brevisquamatus* and *U. maori*).

Uroptychus ritchie sp. nov. Figs 153, 154

Material examined. Holotype NMNZ CR.015254, RV *James Cook* Stn J09/49/89, 39°33.60′S, 178°15.40′E, Ritchie Bank, Hawkes Bay, 880–857 m, 29 Sep 1989, female ov. (16.2 mm, pcl 10.9 mm). **Paratype** *Ritchie Bank*, *Hawkes Bay*: NMNZ CR.025241, locality details same as for holotype, 1 male (11.5 mm, pcl 7.4 mm).

Type locality. Ritchie Bank, Hawkes Bay, 880–857 m.

Distribution. Known only from the type locality (Fig. 154).

Habitat. Unknown.

Diagnosis. Dorsal carapace surface unarmed except for 1 or 2 paired spines directly mesial to first lateral branchial spine and small to obsolescent row of epigastric spines. Lateral margins convexly divergent; with row of about 15 or 16 distinct spines in addition to strong anterolateral spine, many bifurcate, posteriorly diminishing in size in posterior branchial region. Rostrum narrow triangular (width ~0.5 × distance between anterolateral spines). Antennal peduncle with articles 4 and 5 bearing small distal spine each; antennal scale overreaching peduncle. Anterior margin of thoracic sternite 3 broadly V-shaped, without distinct notch and submedian spines. Cheliped ischium with row of distinct regular spines of subequal size along proximal mesial margin (sawtooth). P2–4 propodi with straight flexor margin (not inflated), bearing row of 3–8 spines along flexor margin in addition to distal pair; dactyli distally narrowed (not truncate), with 8 or 9 sharp, obliquely directed spines along entire margin; ultimate, penultimate, and antepenultimate similar in size.

Description. Carapace: pcl [0.8]–0.9 × width, strongly convex. Dorsal surface finely setose, unarmed except for faint row of small and obsolescent spines across epigastric region, small spines mesial to first anterior branchial spine; cervical groove indistinct (faintly indicated). Anterolateral spine well-developed, overreaching much smaller lateral orbital spine; lateral margins convexly divergent posteriorly; with 15 or 16 spines excluding anterolateral spine: 2 or 3 hepatic; 3 anterior branchial; 9–11 posterior branchial (posteriorly diminishing in size to serration); anterior branchial spine largest (excluding anterolateral spine); posterolateral corner slightly ridged. Rostrum narrow triangular (width ~0.5 × distance between anterolateral spines), curving dorsad; 0.5 × pcl; [2.1]–2.3 × longer than wide at base; dorsal surface covered with fine setae; lateral margins with fine lateral serration along distal portion. Pterygostomian flap with a few small

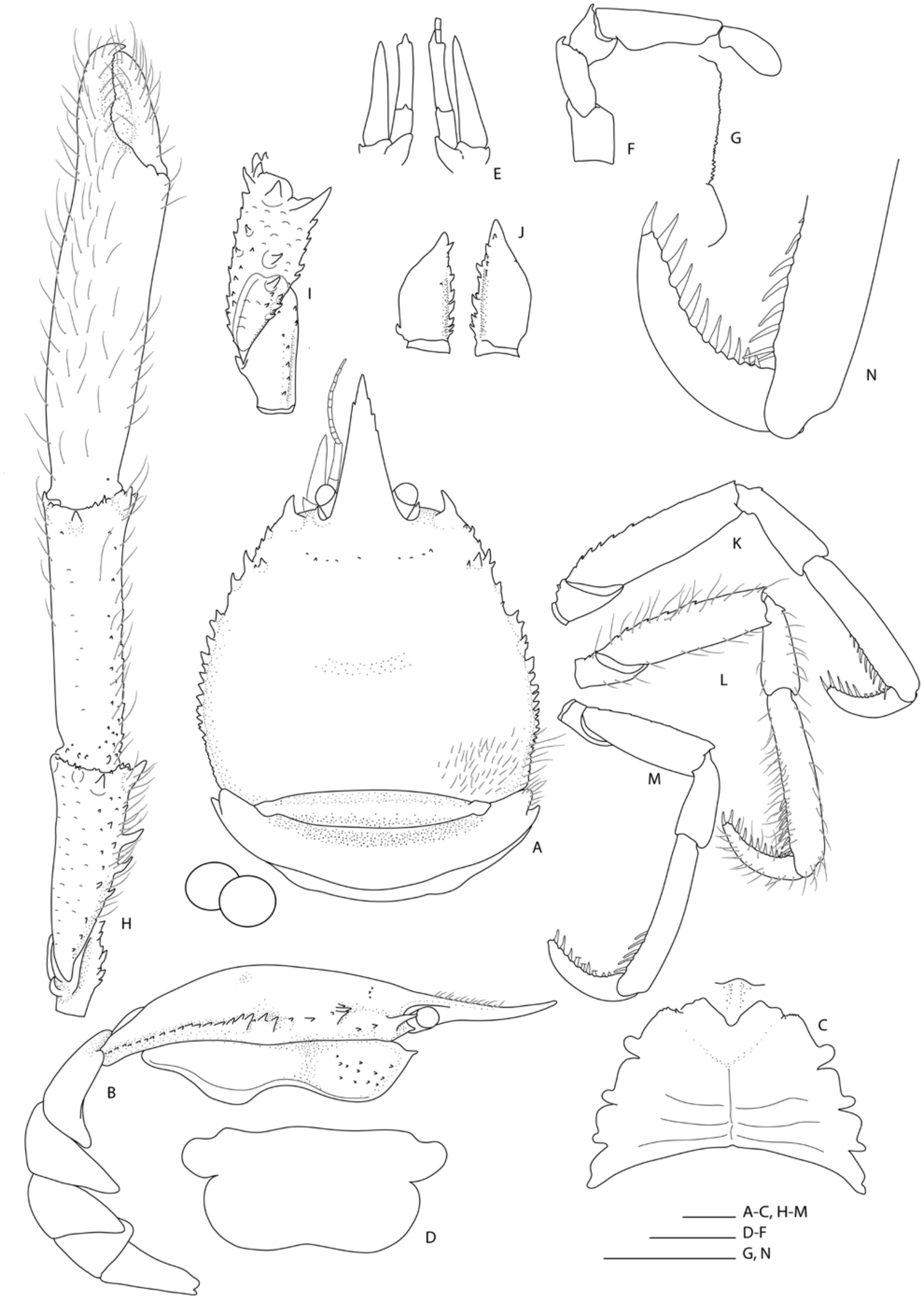


Figure 153. *Uroptychus ritchie* **sp. nov.**, holotype female ov., NMNZ CR.015254: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, entral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of right Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesioventral; **J.** cheliped ischium, right and left, mesial; **K–M.** right P2–4; **N.** distal portion of propodus and dactylus, P3, lateral. Scale bars = 2 mm.

granules scattered around anterior portion; anterior margin produced into spine.

Thoracic sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron 1.5–[1.9] × as wide as long, widening posteriorly; surface smooth. Sternite 3 anterolaterally rounded, anterior margin and with deep V-shaped excavation; median notch absent; lateral margins square without spine near lateral terminus. Sternite 4 2.0 × as wide as sternite 3, anteriorly shallow concave; anterolateral margin rounded, crenulate, with very small mesial spine, longer than posterolateral margin; laterally unarmed. Sternite 5 anterolateral margin unarmed, rounded.

Abdomen: Tergites covered with scattered short, fine setae; without ridges, unarmed. Telson 2.2 × as broad as long; posterior margin emarginated; posterior portion 1.7 × length of anterior portion.

Eyes: Sparsely setose. Cornea subglobular, 0.4–0.5 × length of ocular peduncle.

Antennal peduncle: Article 2 with small but distinct outer spine. Article 3 unarmed. Article 4 segment with small distal spine; mesial margin unarmed. Article 5 segment armed with small distomedian spine; mesial margin unarmed; 1.8 × as long as article 4. Antennal scale overreaching or reaching end of peduncle; 4.3 × as long as wide.

Maxilliped 3: Coxa unarmed. Basis smooth along mesial ridge. Ischium without distal spines; crista dentata minutely serrate along entire length. Merus extensor margin with distal spine; flexor margin with several small acute tubercles. Carpus with proximal spine on extensor margin, otherwise unarmed.

Cheliped: Elongate; 3.6 × as long as carapace (pcl); surface with dense plumose setae along mesial margin. Ischium with dorsal and ventral spines distally, with distinct row of spines along mesial margin, distalmost ventromesial spine subequal in size to proximal spines. Merus with scattered spines across mesial surface; with four distal spines and row of denticles. Carpus surface tuberculate proximally and mesially; with four distal spines and row of denticles; length [0.8]–0.9 × that of palm. Palm 2.7–[3.6] × as long as wide, finely setose. Length of dactylus about 0.5 × as long as propodus; occlusal margins denticulate, without gape.

Pereopods 2–4: Similar; surface setose. Merus dorsal margin with 4–6 spines on proximal half of dorsal crest; ventral margin with distal spine; 1.0–0.7 × as long as propodus (P2–P4); P4 merus shortest. Carpus with one proximal tubercle on dorsal midline, otherwise unarmed; P2 carpus subequally long as P2 dactylus. Propodus 5–6 × longer than wide; extensor margin smooth; flexor margin nearly straight, with 3–8 spines (increasing from P4–P2) in addition to pair of distal spines; 0.5–0.6 × as long as dactylus. Dactylus gently curved; flexor margin with 10 or 11 spines along entire length; all sharp triangular, loosely and regularly arranged; distal 5 spines subequal in size.

Ovum. Holotype with more than 60 eggs, 1.2–1.5 mm diameter.

Colour in life. Unknown.

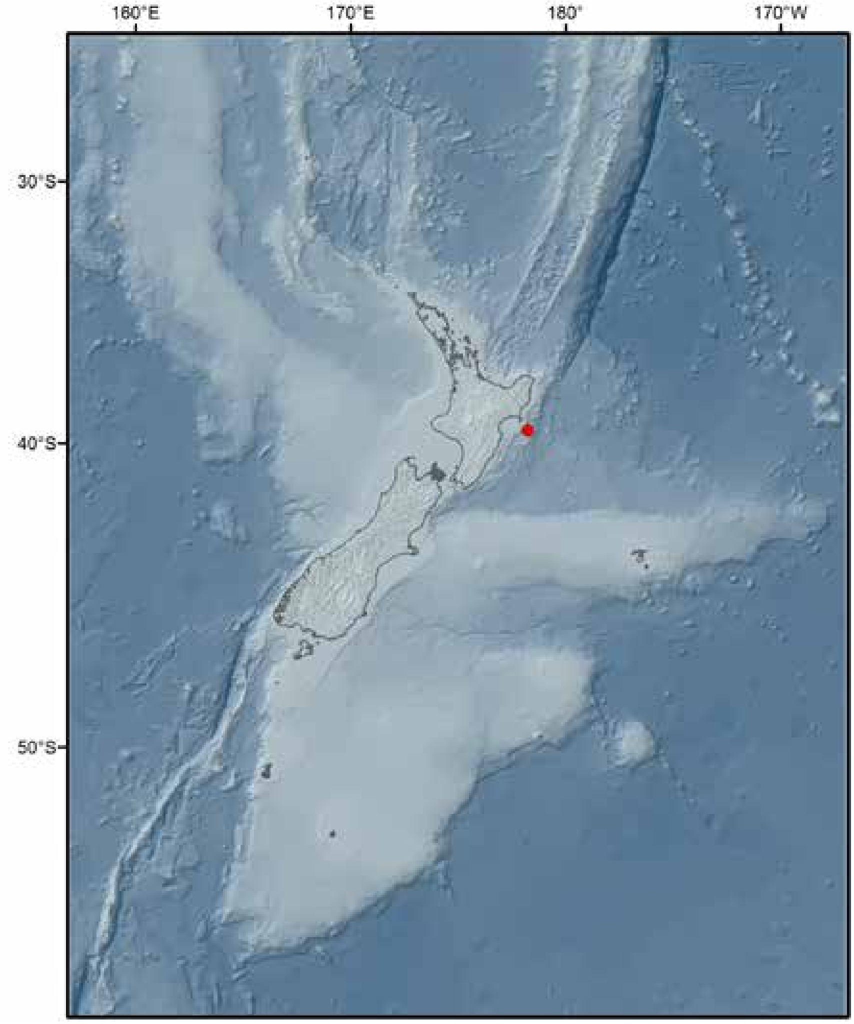
Etymology. Derived from the name of the type locality of this species, Ritchie Bank in eastern Hawke Bay. Used as a noun in apposition.

Remarks. The male and female type specimens of *U. ritchie* **sp. nov.** are similar in overall morphometrics and spination, sharing the combination of the following features: a convexly divergent lateral carapace margin with more than 15 spines, many of them bifurcate; minute or obsolescent epigastric spines; both distal articles of the antennal peduncle with a small distal spine each; the anterior margin of thoracic sternite 3 with a V-shaped excavation, lacking a median notch and submedian spines; the P2–4 propodi with numerous spines along the flexor margin; and the dactyli with 10 or 11 sharp, obliquely directed spines along the flexor margin, with the distal spines all subequal in size (Fig. 153).

Uroptychus ritchie **sp. nov.** can be aligned with *U. insignis* (Henderson, 1885), *U. macquariae* Schnabel, Burghardt & Ahyong, 2017, *U. megistos* Baba, 2018 and *U. zeidleri* Ahyong & Poore, 2004. The new species is easily distinguished from all by the absence of a distally inflated flexor margin of the P2–4 propodi, the margins are subparallel in *U. ritchie* **sp. nov.** and distally inflated on all walking legs in *U. insignis*, *U. macquariae,* and *U. zeidleri* and at least on P2 in *U. megistos*. Additionally, *U. insignis*, *U. macquariae,* and *U. zeidleri* nearly always bear distinct epigastric spines which are absent in the new species (see comments under *U. macquariae*). This character often varies allometrically, but given that the male is small but the female is mature, it is assumed that the absence of epigastric spines in the new species is consistent.

Uroptychus ritchie **sp. nov.** is most similar to *U. zeidleri* in overall carapace shape and lateral spination, with a more or less regular row of lateral branchial spines. In *U. insignis*, *U. macquariae,* and *U. megistos* the prominent anterior branchial spine is posteriorly followed by a smooth margin before the row of posterior branchial spines. This appears as a gap along the lateral margin which is absent in *U. ritchie* **sp. nov.** and *U. zeidleri*. These latter two species also share the regular 'sawtooth' pattern of regular spines on a mesial ridge of the cheliped ischium, which is absent in *U. insignis* and *U. macquariae* and might be present in *U. megistos* (see

Figure 154. Distribution of *Uroptychus ritchie* **sp. nov.** around New Zealand.



comments under that species above). However, in *U. ritchie* **sp. nov.** the distalmost spine is small, subequal to the proximal spines, while it is prominent and much larger than the proximal spines in the other species.

Using Baba's (2018) key to species of *Uroptychus*, *U. ritchie* **sp. nov.** is paired with *U. magnispinatus* Baba, 1977a based on the straight P2–4 propodal flexor margin. *Uroptychus magnispinatus* from Midway Island differs in that the carapace lateral margins are subparallel (not divergent and distinctly convex like in *U. ritchie* **sp. nov.**) and that the anterior branchial margin bears a large spine that is followed with only 3 or 4 spines posteriorly (*U. ritchie* **sp. nov.** has more than 15 small spines, slightly larger on the anterior branchial margin and progressively diminishing in size on the posterior branchial margin). Finally, the cheliped in *U. magnispinatus* is 1.8–2.0 × the cl while it is 2.3–2.4 × cl in *U. ritchie* **sp. nov.** (male and female, respectively).

ZooBank registration. *Uroptychus ritchie* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:2B74A19E-6F97-42C9-AA05-8D96472B2E72.

***Uroptychus rungapapa* sp. nov.** Figs 155, 156

Material examined. Holotype NIWA 23815, NIWA Stn KAH0011/41, 37°33.0′S, 176°58.0′E, Rungapapa Knoll, Bay of Plenty, 154–260 m, 5 Nov 2000, female ov. (10.5 mm, pcl 6.9 mm). **Paratype** *Bay of Plenty, White Island Ridge*: NIWA 106416, NZOI Stn J680, 37°25.80′S, 177°11.75′E, 328 m, 08 Sep 1974, 1 male (6.1 mm, pcl 4.0 mm).

Type locality. Rungapapa Knoll, Bay of Plenty, 154–260 m.

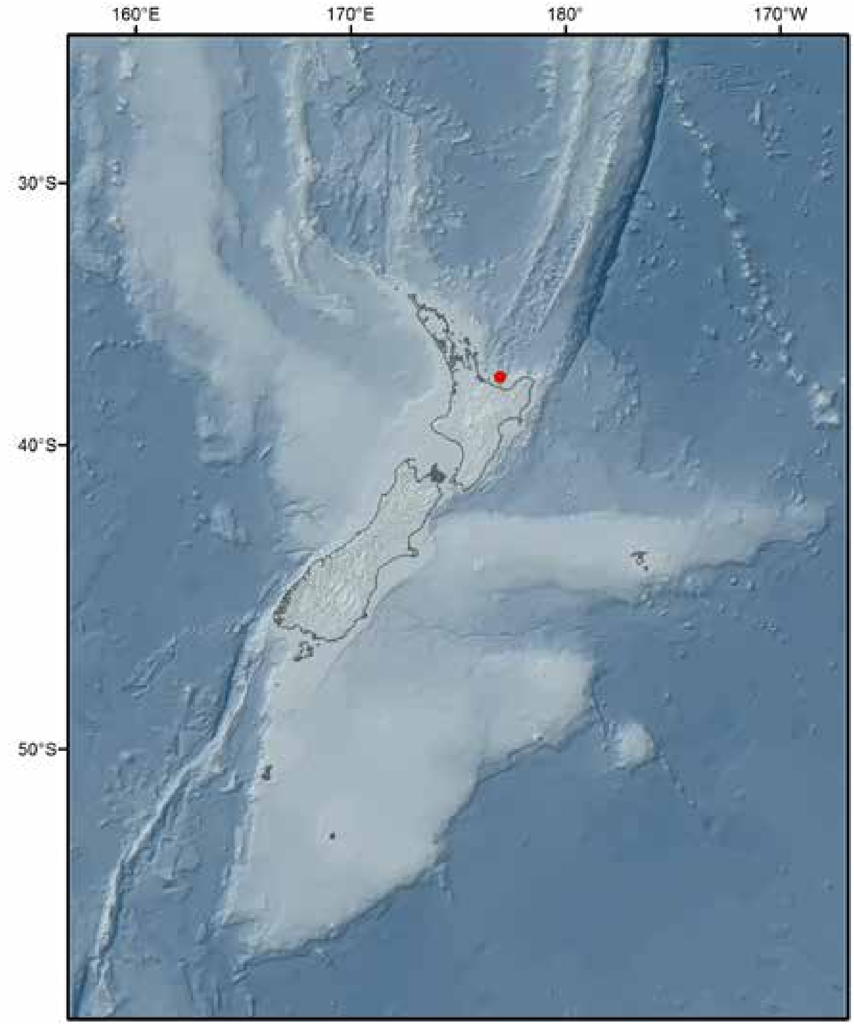
Distribution. Bay of Plenty, 154–328 m (Fig. 156).

Habitat. The female holotype of *U. rungapapa* **sp. nov.** was collected in 2000 on the west side of Rungapapa Knoll, a submerged volcano in the southern Bay of Plenty with the summit at 140 m and a gradual slope off the broad summit area to surrounding depths of 400–500 m (Clark *et al.* 2000). The male paratype was collected with a black coral, *Saropathes* cf. *scoparia* (Totton, 1923), in 1974 on the crest of White Island Ridge, about 22 km northeast of the type locality.

Diagnosis. Carapace dorsally smooth, unarmed; lateral margin with one distinct spine other than

Figure 155. *Uroptychus rungapapa* **sp. nov.**, holotype female ov., NIWA 23815: **A.** carapace and abdomen, dorsal; **B.** carapace and anterior abdominal segments, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus and dactylus, left P3, lateral. Scale bars = 2 mm.

Figure 156. Distribution of *Uroptychus rungapapa* **sp. nov.** around New Zealand.



anterolateral spine, strongly divergent posteriorly. Rostrum narrow (width < 0.5 distance between anterolateral spines at base). Thoracic sternite 3 shallow concave anteriorly, with V-shaped median notch, submedian spines absent. Ocular peduncle about 3 × longer than broad, cornea 0.15 × length of ocular peduncle. Mxp3 entirely unarmed. Cheliped smooth except for a dorsal and mesial spine on ischium and a few mesial granules on the proximal portion of the merus. P2–4 meri and carpi unarmed, P4 merus shortest, ¾ length of P2–3 meri; propodi flexor margins straight, with row of spines along flexor margin, distally paired; dactyli distally narrowed (not truncate), with 11–16 sharp triangular, obliquely arranged spines along flexor margin; ultimate small, penultimate and antepenultimate spines subequal in size.

Description. Carapace: pcl [0.7]–0.8 × width, moderately convex from side to side. Dorsal surface smooth, unarmed; cervical groove indistinct (faintly indicated). Lateral orbital spine small, much smaller than anterolateral spine. Anterolateral spine well-developed, distinctly overreaching lateral orbital; lateral carapace margins strongly convex, with one large spine in anterior branchial region, otherwise unarmed. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines), slightly deflected ventrally; 0.5 × pcl; 2.3 × longer than wide at base; dorsal surface smooth and glabrous; lateral margins smooth. Pterygostomian flap surface smooth; anterior margin produced into small spine.

Thoracic sternum: Excavated sternum anteriorly rounded and smooth on surface. Sternal plastron 1.4–[1.9] × as wide as long, distinctly widening posteriorly; surface smooth. Sternite 3 anterolaterally angular; median notch present, without submedian spines; lateral margins rounded, unarmed. Sternite 4 1.8 × as wide as sternite 3, anteriorly shallow concave, boundary between sternites 3 and 4 indistinct, anterior midline slightly grooved; anterolateral margin rounded, much longer than posterolateral margin; laterally unarmed.

Abdomen: Tergites smooth and unarmed. Pleural margins of somites 2–4 strongly tapering distally, concave margins. Telson 3.0 × as broad as long; posterior margin emarginated; posterior portion as long as anterior portion.

Eyes: Smooth. Ocular peduncle > 3 × longer than wide; cornea subcylindrical, less than 0.2 × length of ocular peduncle, distally distinctly narrowed.

Antennal peduncle: Article 2 with small but distinct outer spine. Article 3 unarmed. Article 4 with small distal spine; mesial margin unarmed. Article 5 unarmed; 1.1 × as long as article 4. Antennal scale reaching to midlength of article 5; 2.7–3.2 × as long as wide.

Maxilliped 3: Coxa unarmed. Ischium without distal spines; about 40 small denticles along entire crista dentata, successively smaller distally. Otherwise unarmed.

Cheliped: Stout, sparsely setose; 3.9 × pcl; surface smooth. Ischium with distinct 'thorn'-like dorsal and blunt ventromesial spine. Merus with mesial tubercles proximally; distally unarmed. Carpus smooth and glabrous; unarmed distally other than small distoventral granule; length 0.7 × that of palm. Palm 3.3 × as long as wide, unarmed. Dactylus 0.4 × as long as propodus; occlusal margins denticulate, with slight gape.

Pereopods 2–4: Similar, stout; surface smooth, setose. Merus unarmed; 1.0–0.7 × as long as propodus (from P2–4); merus of P4 short, three-quarters length of P2 and P3 meri. Carpus dorsal margin unarmed. Propodus 4.3–4.4 × longer than wide; extensor margin smooth; flexor margin nearly straight, with 6–8 spines in addition to distal pair of spines; 1.6 × as long as dactylus. Dactylus gently curved; flexor margin, with 11–16 [15 on P2 and P3, 16 on P4] spines along entire length, all sharp triangular, loosely and regularly arranged; ultimate spine slightly more slender than penultimate.

Ovum. Holotype with 22 fully mature and freshly hatched eggs and larvae under the abdomen, egg diameter 1.6–1.8 mm.

Colour in life. Not known.

Etymology. Named after the type locality. Rungapapa is derived from the Māori word for 'top or upper part' (runga) and 'broad, flat and hard' (papa). Used as a noun in apposition.

Remarks. The male paratype is smaller (pcl 4.0 mm instead of 6.9 mm of female holotype illustrated in Fig. 155), and both the carapace and the sternal plastron are more slender in the male (pcl is 0.8 × carapace width instead of 0.7 for the female and the sternum is 1.9 × as wide as long in the female and 1.4 × in the male). The male chelipeds are missing (the left cheliped is minute and in the progress of regeneration), and the specimen differs slightly from the holotype in the following: the anterolateral spine of the carapace is less robust and more slender than illustrated for the holotype; sternite 4 is anterolaterally angular, not rounded; and the antennal scale is terminally acute and not rounded, although it terminates at mid length of the article 5 as in the holotype.

Uroptychus rungapapa **sp. nov.** most closely resembles *U. novaezealandiae* Borradaile, 1916 with the single lateral carapace spine and the elongate ocular peduncle. To date, only the single female holotype is known for *U. novaezealandiae* and, unfortunately, all the appendages have been lost. With a pcl of 2.7 mm, it is much smaller than either specimen of *U. rungapapa* **sp. nov.**, so it would be problematic to compare some meristics that are typically allometrically influenced. For example, the carapace length-width ratio of the female holotype of *U. rungapapa* **sp. nov.** is 1.4 which is greater than the ratio of 1.2 for *U. novaezealandiae*; however, the smaller male also has a pcl length-width ratio of 1.2, therefore, this is not diagnostic. Both *U. rungapapa* **sp. nov.** and *U. novaezelandiae* have a uniquely elongated eye stalk, which is ≥ 3 × as long as wide (typically ≤2 in other species of this genus). In *U. novaezealandiae*, however, the shape is subcylindrical and the cornea occupies around a fifth of the length of the peduncle. The male of *U. rungapapa* **sp. nov.** has a more subcylindrical eyestalk while the ocular peduncle appears more distally narrowed in the holotype, but in both specimens, the cornea occupies around a sixth of the peduncle.

The posterior portion of the carapace appears more significantly convex for *U. rungapapa* **sp. nov.** and the carapace is moderately curved from side to side (compared to a shallow curvature on the carapace of *U. novaezealandiae*. The sternal plastron is narrower in *U. novaezealandiae* (width-length ratio is 1.25) than in *U. rungapapa* **sp. nov.** (width-length ratio in female holotype is 1.9 and in male 1.4). The Mxp3 merus has two distinct tubercles along the flexor margin and a distal spine on the carpal extensor margin in *U. novaezealandiae*; both are absent in *U. rungapapa* **sp. nov.** According to Borradaile's (1916) illustrations and text, the cheliped merus and carpus bear two dorsodistal spines each, which is absent in *U. rungapapa* **sp. nov.** Also, the walking legs illustrated for *U. novaezealandiae* are more slender and the propodi bear rows of spines along the entire flexor margin, while in *U. rungapapa* **sp. nov.** the spines are present along the proximal half of the propodal flexor margin. However, the type description mentions "a few slender spines at end of propodite" (Borradaile 1916: 94); hence, the walking leg characteristics need to be reviewed if new material of *U. novaezealandiae* is collected.

ZooBank registration. *Uroptychus rungapapa* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:0422AEF6-C389-4748-87EB-8EF5DB02A368.

Uroptychus rutua Schnabel, 2009 Figs 157, 158

Uroptychus rutua Schnabel, 2009a: 564, figs 7, 13; Schnabel 2009b: 30 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 209 (list); Baba 2018: 29 (key).

Material examined. Holotype—NMNZ CR.012083, NZOI Stn K857, 30°33.79′S, 178°30.59′W, Raoul Island, Kermadec Islands, 165–180 m, 30 Jul 1974, female (4.5 mm, pcl 3.3 mm). Paratype—NIWA 43869, same locality as holotype, 1 male (3.9 mm, pcl 2.7 mm).

Other material. *Raoul Island*, *Kermadec Islands*: NMNZ CR.025242, RV *Acheron* Stn 73310, 29°12.60′S, 177°56.80′W, 155–165 m, 4 Apr 1973, 1 male (3.2 mm, pcl 2.0).

Type locality. Raoul Island, Kermadec Islands, 165–180 m (Fig. 158).

Distribution. As for type locality.

Habitat. Unknown.

Diagnosis. Carapace approximately as wide as long; lateral margin without distinct spines or processes other than anterolateral spine; dorsal surface unarmed except for small spines and granules in hepatic region, with broad prominences on the gastric region. Lateral orbital spine prominent, overreaching small anterolateral spine. Rostrum width at base about half distance between anterolateral spines. Sternite 3 anterolaterally rounded; anterior margin with median notch and submedian spines. Antennal article 2 with distinct lateral spine; article 4 with distal spine, otherwise unarmed. Pereopods 2–4 meri subequal in length; propodi with pair of distal spines on flexor margin only; dactyli distally narrowed, longer than carpi, with 7 or 8 spines on flexor margin, ultimate spine much more slender than and close to penultimate, ≤ 2 × wider than antepenultimate, remaining spines sharp triangular, loosely arranged and perpendicular to flexor margin.

Colour in life. Unknown.

Remarks. One additional specimen of *U. rutua* has been made available since it was originally described (Schnabel 2009a). The small male was collected very close to the type locality and at a pcl of 2.0 mm it represents the smallest specimen of this species to date (the smallest female NMNZ CR.012084 has a pcl of 2.6 mm) but it matched the type specimens well. The anterior margin of thoracic sternite 3 bears two distinct submedian spines, which matches both the paratypes (in the holotype, one of the spines is indistinct), and the excavated sternum is rounded with a distinct ridge in midline, a character not described in Schnabel (2009a) (Fig. 157D).

Uroptychus rutua is remote from its closest morphological ally *U. toka* in the key to *Uroptychus* based on the early split of the P2–4 dactylar spination. *Uroptychus toka* has a prominent penultimate spine, much wider (≥ 2 ×) compared to the antepenultimate spine. This contrasts with *U. rutua* where the penultimate spine is a little wider but not as prominent compared to the proximal spines (Fig. 157M). These two species otherwise share most of the morphological features but they can be distinguished from each other by the ornamentation of the carapace, paired broad gastric eminences in *U. rutua* that are absent in *U. toka*, a pair of small spines in the hepatic region, directly behind the anterolateral spines, in *U. toka*, that are absent in *U. rutua*, and a distinct anterior branchial lateral process in *U. toka* that is not apparent in *U. rutua*.

Uroptychus rutua might also be considered closely related to *U. helenae* **sp. nov.**, *U. philippei* Baba, 2018, *U. bertrandi* Baba, 2018 and *U. sarahae* Baba, 2018, sharing the small anterolateral spine of the carapace (subequal to or smaller than the lateral orbital spine), a short antennal scale ending at most at the midlength of the article 5, the P2–4 dactyli with loosely arranged, perpendicularly-directed flexor marginal spines, and the pterygostomian flap covered with denticle-like small spines. *Uroptychus rutua* is readily distinguished from all of these species by the unique broad prominences on the gastric region. Other distinguishing characteristics are discussed under *U. helenae* **sp. nov.** above.

In the key to New Zealand species of *Uroptychus*, *U. rutua* is paired with *U. enriquei* Baba, 2018; see the account for that species for characters that distinguish these species.

Uroptychus sadie **sp. nov.** Figs 159, 160

Material examined. Holotype NIWA 54361, NIWA Stn TAN0905/121, 44°1.67–1.87′S, 174°35.46–34.45′W, summit of Aloha Seamount, Andes Seamount Complex, 801–823 m, 28 Jun 2009, male (8.1 mm, pcl 4.5 mm; sequenced, see Fig. 5). **Paratypes** *L'Esperance Rock*, *Kermadec Ridge*: AKM MA73582 (ex NIWA 119256), Kermadec-Rangitahua Stn TAN1612/125, 31°24.02–23.93′S, 178°40.29–40.38′W, 840–900 m, 03 Nov 2016, 1 female (rostrum broken, pcl 5.4 mm). *Hikurangi Margin*, *Rock Garden Knoll*: NMNZ CR.025243 (ex NIWA 29243), NIWA Stn TAN0616/6, 40°2.31–2.47′S, 178°8.58–8.63′E, 730–747 m, 04 Nov 2006, 1 male (8.6 mm, pcl 5.0 mm).

Type locality. Summit of Aloha Seamount, Andes Seamount Complex, 801–823 m.

Distribution. Central Kermadec Ridge, Hikurangi Margin and southeastern margin of Chatham Rise, on seamount and near carbon seep, 730–900 m (Fig. 160).

Figure 157. *Uroptychus rutua* Schnabel, 2009, A–C, E–L, holotype female, NMNZ CR.012083; D, M, paratype male, NIWA 43869: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** sternal plastron; **D.** excavated sternum and sternites 3–4; **E.** telson; **F.** antenna, left, ventral; **G.** endopod of Mxp3, left, lateral; **H.** crista dentata, left; **I.** right cheliped, dorsal; **J–L.** right P2–4; **M.** distal propodus and dactylus of a loose leg. Scale bars = 2 mm. Modified after Schnabel (2009).

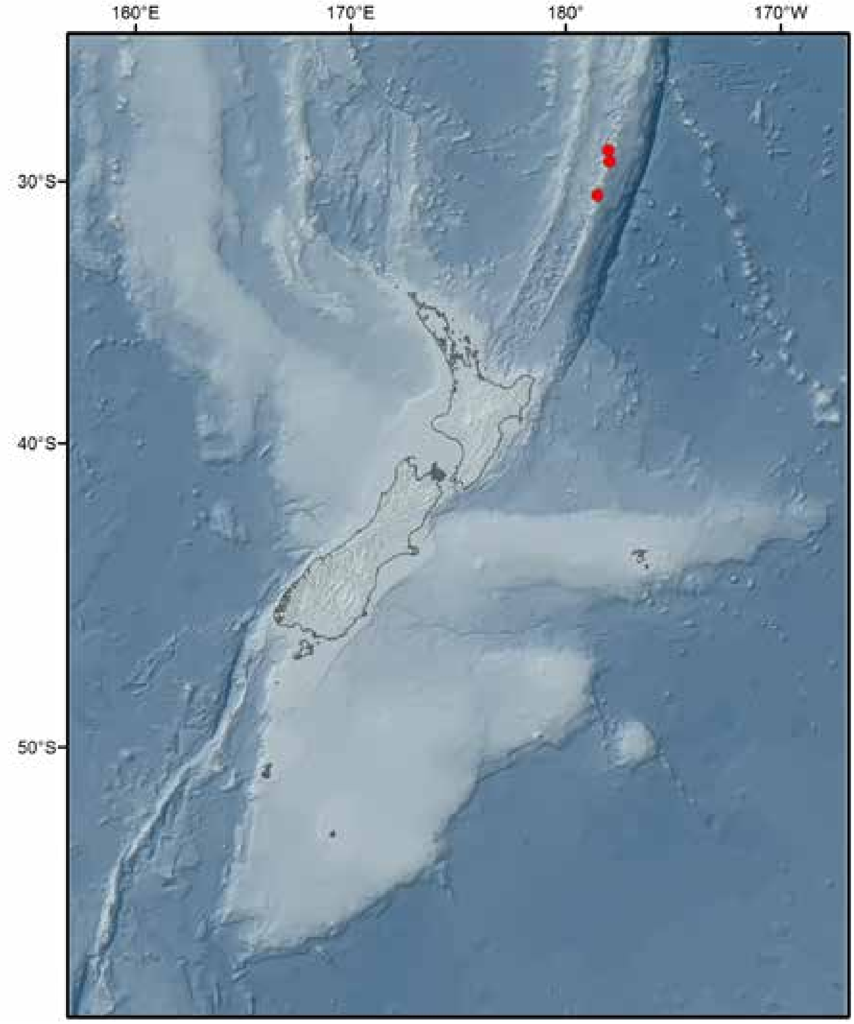


Figure 158. Distribution of *Uroptychus rutua* Schnabel, 2009 around New Zealand.

Habitat. There is no information on possible associations of *U. sadie* **sp. nov.** with other organisms. The present specimens were collected from seamounts and knolls, with comments on the remaining catch and seabed images including diverse invertebrate fauna including sponges, antipatharians, gorgonians, some scleractinians and stylasterids. Sample NMNZ CR.025243 from Rock Garden was collected in close vicinity to a cold seep, with video footage of the area showing carbonate boulders and pavement. Despite evidence of some seep activity (acoustic flare signal and small chimneys), few distinct seep fauna were evident (Baco *et al.* 2010).

Diagnosis. Carapace lateral margin with distinct spines, other than anterolateral spine; dorsal surface deeply sculpted, with a series of distinct spines in gastric, cardiac, and branchial regions, with some additional small scattered spines. Rostrum narrow, about 0.3 × distance between anterolateral spines; long, 0.7–0.8 × pcl; with a series of lateral spines. Abdominal somites 1 and 2 armed with spines. Excavated sternum with distinctly ridged midline. Sternite 3 with narrow median notch flanked by small submedian spines; sternite 4 and 5 with pairs of large lateral spines. Coxae of cheliped and P2 with distinct ventral spines. Cheliped palm with rows of spines continued from merus and carpus. P2–4 propodi proximal spines along the extensor margin, arranged in zigzag pattern; with slight expansion along flexor margin; dactyli tapering distally; with 8–10 sharp triangular spines, obliquely and loosely arranged, decreasing in size posteriorly; distal spines subequal in size.

Description. Carapace: pcl [0.8]–1.0 × width; shallow convex from side to side. Dorsal surface with three longitudinal rows of strong spines: median row (1 spine epigastric, 1 mesogastric, 1 cardiac, 1 intestinal) and 2 flanking rows (each of 1 lateral epigastric spine, 1 postcervical, 2 posterior branchial); anterior gastric and hepatic regions with scattered small spines; cervical groove deep and distinct. Lateral orbital spine small. Anterolateral spine well-developed, overreaching lateral orbital spine; lateral margins convexly divergent posteriorly; with 9–10 spines excluding anterolateral spine: 2 or 3 small hepatic; 1 large anterior branchial; 4 strong posterior branchial spines (with 2 small interspersed spines); anteriormost posterior branchial spine largest. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines); directed slightly dorsally, 0.8 × pcl; dorsal surface dorsally excavated; lateral margins with 5 spines. Pterygostomian flap

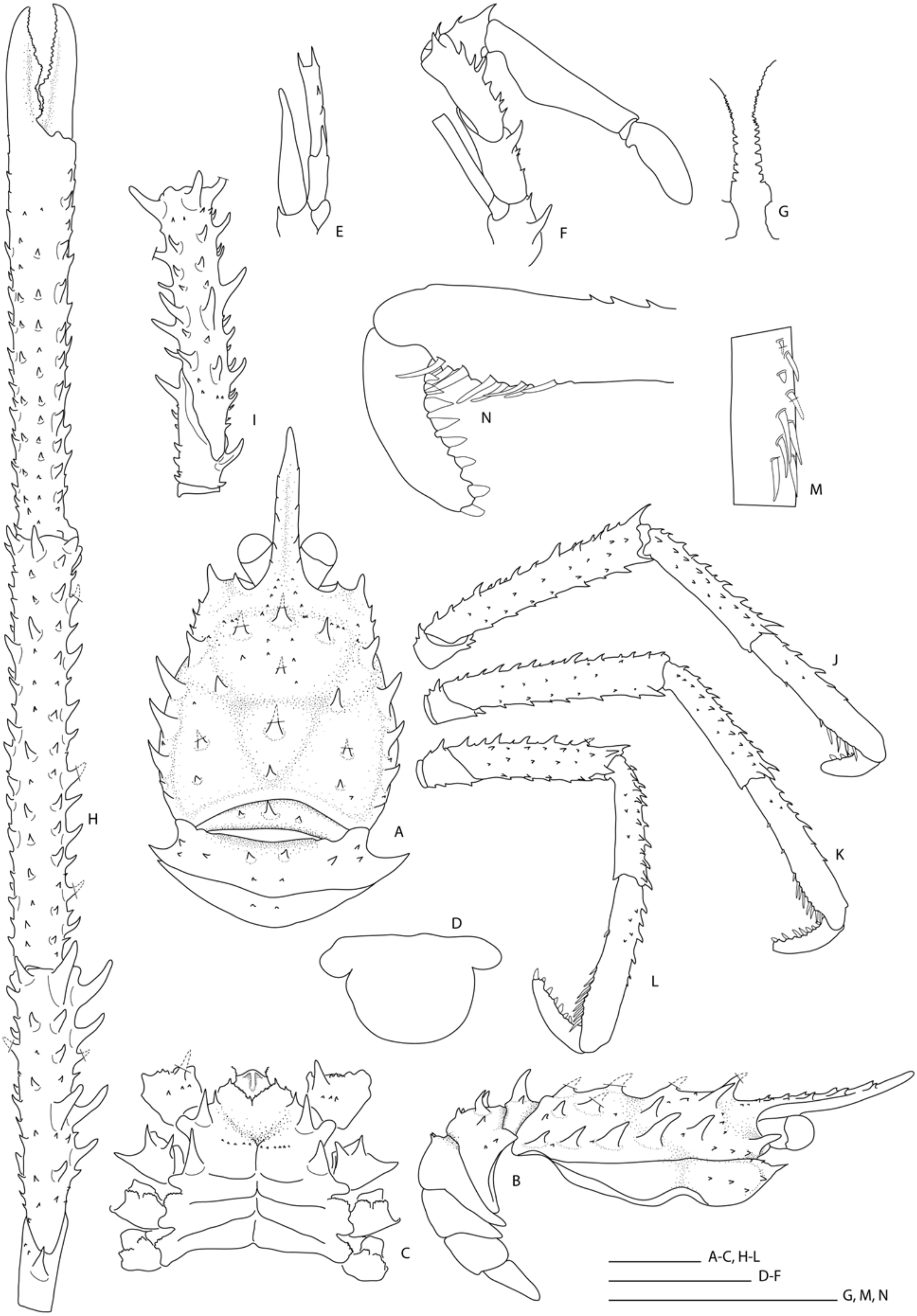


Figure 159. *Uroptychus sadie* **sp. nov.** holotype, male, NIWA 54361: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** sternal plastron and coxa of pereopods 1–4; **D.** telson; **E.** antenna, right, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata of right and left Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** distal portion of propodus flexor margin, P4, ventral view; **N.** distal portion of P3 propodus and dactylus, left. Scale bars = 2 mm.

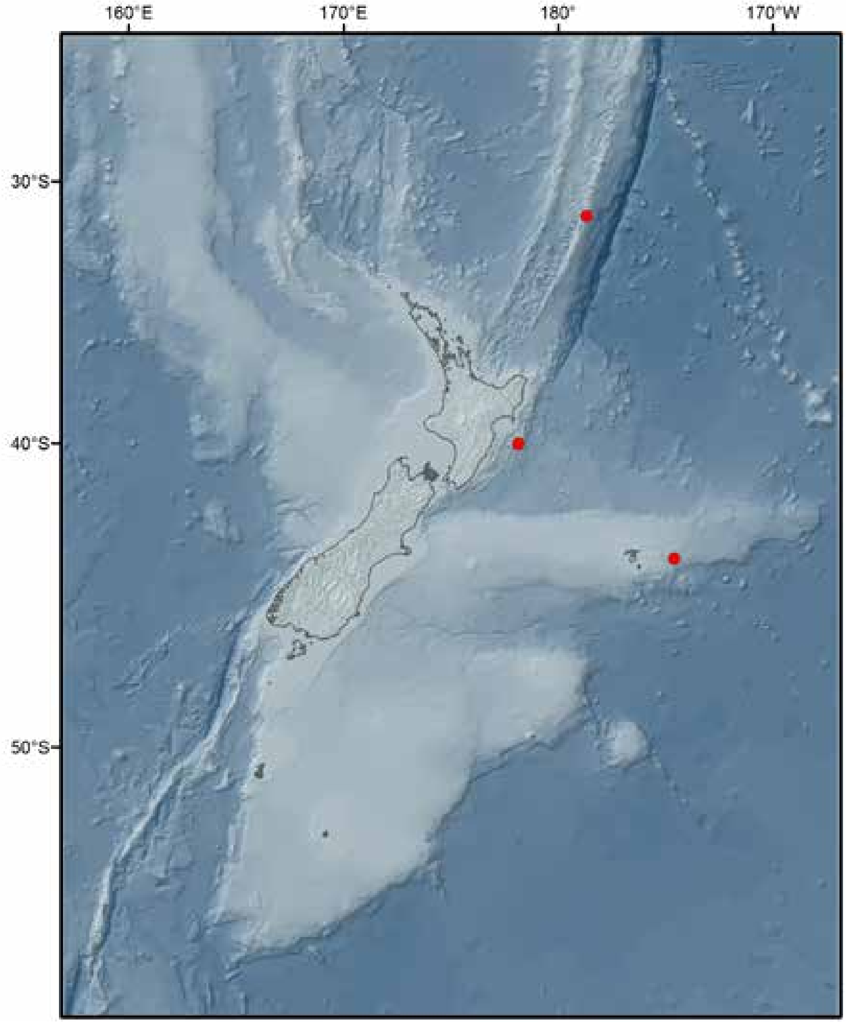


Figure 160. Distribution of *Uroptychus sadie* **sp. nov.** around New Zealand.

surface with small scattered spines in anterior portion; anterior margin produced into spine.

Thoracic sternum: Excavated sternum with rounded anterior margin and distinctly ridged midline. Sternal plastron 1.2 × as wide as long, widening posteriorly. Sternite 3 anterior margin serrated, strongly produced at lateral angle; with median notch and submedian spines; lateral margins with small spines on rounded margin; surface smooth. Sternite 4 2 × as wide as sternite 3, surface with small spines along transverse row, anteriorly deeply concave, followed by grooved midline; anterolateral margin with sharp spine, not overreaching sternite 3; about as long as posterolateral margin; with strong spine near posterior end. Sternite 5 anterolateral margin with strong anterior spine.

Abdomen: Tergites sparsely setose. Tergite 1 with prominent median spine flanked by pair of small spines. Tergite 2 with transverse ridge, with 2 pairs of median spines, anterior pair largest, lateral portion with scattered small spines. Tergite 3 with pair of small submedian spines on anterior portion. Tergites 4 and 5 unarmed. Pleural margins of somites 2–4 distally narrowing to long triangular point. Telson 1.7 × as broad as long; posterior margin rounded; posterior portion 1.9 × length of anterior portion.

Eyes: Smooth. Cornea subglobular, about 0.5 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine. Article 3 unarmed. Article 4 with long distal spine; mesial margin unarmed. Article 5 armed with two distal spines; mesial margin unarmed; 1.6 × as long as article 4. Antennal scale overreaching midlength but not reaching end of article 5; nearly 5 × as long as wide.

Maxilliped 3: Coxa with large mesial spine. Basis smooth along mesial ridge. Ischium with strong distal spine and small spines along flexor margin; crista dentata with 15 denticles. Merus extensor margin unarmed; flexor margin with row of strong spines along entire margin; distolateral spine strong. Carpus extensor margin with 3 or 4 spines.

Cheliped: Slender; 5.9–[6.3] × pcl; surface spinose. Ischium with dorsal and ventral spines distally and with row of spinules on ventromesial margin. Merus surface strongly spinose; with five distal spines. Carpus surface with eight longitudinal rows of spines; with five distal spines or blunt processes; length 1.1 × that of palm. Palm 5.5–9 [7] × as long as wide; with eight rows of distinct spines. Dactylus 0.3 × as long as propodus; occlusal margins denticulate, without gape.

Pereopods 2–4: Similar; surface spinose. Merus with 2 dorsal rows of spines, including 9–11 spines on dorsal crest; two lateral rows; 2 ventral rows, 5–8 short spines on ventral margin; 1.3–0.8 (from P2–P4) × as long as propodus, shortest merus on P4. Carpus dorsal margin with double row of spines and a few scattered small spines laterally; with 11 spines on dorsal crest (includes distal); ventrally unarmed. Propodus 5.4–5.6 × longer than wide (P2–P4); extensor margin spinose, with 5 or 6 spines in distal half to two-thirds, a few small scattered spines laterally; flexor margin with eight spines along distal portion of margin in addition to distal pair, spines arranged in zigzag pattern, distal margin slightly inflated; 2.5–2.4 × as long as dactylus (from P2–4). Dactylus gently curved; flexor margin with [8]–10 movable spines along entire length, all stout triangular, loosely arranged; ultimate spine subequal in size to penultimate; penultimate slightly more distant from antepenultimate compared to ultimate.

Colour in life. Not known. Comment NIWA 54361 states "3 bands along abdomen"; unfortunately, no photo was taken.

Etymology. Named in honour of Sadie Mills, Collection Manager of the NIWA Invertebrate Collection, in recognition of her support over many years and in thanks for her friendship. Used as a noun in apposition.

Remarks. The type material of *U. sadie* **sp. nov.** contains two males and one female. The male holotype (NIWA 54361) is missing the finger on the right cheliped and the male paratype (NMNZ CR.025243) has a minute left cheliped, obviously in the process of regrowth. The three specimens are similar in both morphometrics and spination. Slight variation that has been noted is that the male paratype and the female have a few additional scattered granules and some more distinct tufts of plumose setae on the surfaces between the major spines around the posterior branchial region, the holotype comparably smoother; the rostrum bears a few scattered dorsal spines in the male paratype, while spines are confined to the lateral margin in the holotype and the female paratype; the mesial margin of the article 5 of the left antennal peduncle bears three small spines in the male paratype and the female, while both articles 5 bear two spines in the holotype (Fig. 159E). The cheliped of the paratypes are slightly shorter at 6.0 × pcl (the holotype has a cheliped 6.3 × pcl), but the palm in the male paratype is more massive at 5.5 × longer than wide (compared to nine times in the female).

Uroptychus sadie **sp. nov.** aligns with other species that bear spines across the entire carapace surface and on some of the abdominal tergites, the anterior margin of sternite 3 with a notch flanked by submedian spines and where the penultimate and the antepenultimate spines of the P2–4 dactyli are subequal in size. This includes *U. ciliatus* (van Dam, 1933), *U. spinirostris* (Ahyong & Poore, 2004), *U. numerosus* Baba, 2018, *U. quartanus* Baba, 2018, and *U. senarius* Baba, 2018. The combination of a long rostrum (0.7–0.8 × pcl), unarmed abdominal tergites 4–6, and antennal article 5 bearing two distal spines, and an inflated flexor margin of the P2–4 propodi makes this species unique. For example, *U. numerosus* has a similarly long rostrum and two distal spines on the antennal article 5, but the flexor margin of the P2–4 propodi is straight and not inflated and the abdominal tergites and pleura of all abdominal somites are distinctly spinose. Similarly, *U. spinirostris* has a long rostrum (with fewer lateral spines), but it lacks one of the distal spines on antennal article 5, has straight instead of inflated P2–4 propodal flexor margins, and has large scattered spines on all the abdominal somites 3–5. In addition, both *U. spinirostris* and *U. numerosus* bear distinct spines on the surface of sternite 4, which is absent in *U. sadie* **sp. nov.** Other New Zealand species with spines and/or granules scattered across the entire carapace surface are *U. paku* Schnabel, 2009, *U. tracey* Ahyong, Schnabel & Baba, 2015, *U. taniwha* **sp. nov.**, and *U. taratara* **sp. nov.**, but all of them have unarmed abdominal somites, and lack the additional spines along the mesial and distal margins of antennal article 5 and the strong lateral spines on thoracic sternites 4 and 5.

DNA sequence data. Interspecific sequence divergences for partial CO1 gene: >12%.

ZooBank registration. *Uroptychus sadie* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:1DF786FF-0033-4772-870B-082E6F8B51AC.

Uroptychus spinirostris (Ahyong & Poore, 2004)

Figs 161–164

Gastroptychus spinirostris Ahyong & Poore, 2004: 9, fig. 1.
Uroptychus spinirostris; Baba 2005: 231 (synonymies, key); Baba *et al.* 2008: 43 (list and synonymies); Schnabel 2009b: 30 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 210 (list); McCallum & Poore 2013: 165, figs 8, 12A; Baba 2018: 489, figs 245, 306E.

Type & locality (not examined). Holotype—AM P31418, Stn K78-09-03, 28°02–05′S, 153°57′E, NE of Tweed Heads, Queensland, 364 m, 1 male (cl 7.3mm).

Material examined. *Norfolk Ridge (Australian EEZ)*: NIWA 14550, NZOI Stn P46, 28°42.3′S, 167°56.7′E, 475 m, 30 Jan 1977, 1 female (18.8 mm, pcl 11.7 mm); NIWA 106428, NZOI Stn I94, 29°20.20′S, 168°10.8′E, 308 m, 24 Jul 1975, 1 female ov. (6.1 mm, pcl 3.6 mm).

Figure 161. Live coloration of *Uroptychus spinirostris* (Ahyong & Poore, 2004), NMNZ CR.022685, Stn TAN0308/126.

Reinga Ridge: NMNZ CR.022685 NORFANZ Stn TAN0308/126, 33°23.50–23.76′S, 170°11.58–12.80′E, 490–526 m, 31 May 2003, 1 female ov. (15.3 mm, pcl 10.6 mm).

West Norfolk Ridge: NMNZ CR.022697, NORFANZ TAN0308/154, 34°37.2–37.68′S, 168°57.03–58.10′E, 521–539 m, 3 Jun 2003, 1 male (5.1 mm, pcl 2.7 mm; sequenced, see Fig. 5).

East of Poor Knights Islands: NMNZ CR.025244, 329 m (180 fms), 01 May 1969, 1 female ov. (19.4 mm, pcl 12.5 mm).

Bay of Plenty, *Tumokemoke Knoll*: NIWA 8992, NIWA Stn TAN0413/166, 37°28.19–28.15′S, 176°55.15–54.94′E, 240–212 m, 15 Nov 2004, 1 male (8.0 mm, pcl 4.8 mm; sequenced, see Fig. 5).

Bay of Plenty, *Rungapapa Knoll*: NIWA 23782, NIWA Stn KAH0011/40, 37°32.98–32.97′S, 176°58.24–58.63′E, 280–155 m, 05 Nov 2000, 1 female (6.1 mm, pcl 3.6 mm), 1 male (5.2 mm, pcl 3.1 mm).

Distribution. Queensland (Ahyong & Poore 2004); Western Australia (McCallum & Poore 2013); New Caledonia, the Norfolk Ridge, Monts Gemini, Vanuatu and the Kai Islands (Indonesia) (Baba 2018), 315–1074 m; off Norfolk Island, Northland Plateau, southern Kermadec Ridge, 155–539 m (Fig. 164).

Habitat. There is little information about the ecology of this species; only one sample (NMNZ CR.025244) contains a note "with sponges".

Diagnosis. Carapace, all abdominal tergites, pterygostomian flap and pereopods covered with spines, occasionally very setose. Lateral orbital spine slender and sharp, falling short of large anterolateral spine. Rostrum basal width < 0.5 × distance between anterolateral spines; length > 0.6 × pcl, usually 0.7–0.8, distally narrowed to simple point; laterally with 2 or 3 large spines. Anterior margin of sternite 3 with median notch and submedian spines. Sternite 4 with pronounced lateral pair of spines and 1 or 2 submedian pairs (usually 1) on surface. Antennal article 3 with distomesial and small spine at ventral midline near juncture with article 4; articles 4 and 5 each with strong distal spine, and additional ventral spines at midlength typically present, at least in large specimens. P2–4 dactyli distally narrowing (not truncate), with 8–13 sub-perpendicular spines along flexor margin, ultimate slightly more slender than penultimate.

Colour in life. Illustrated by McCallum & Poore (2013: fig. 12A) from Western Australia and Baba (2018) from Vanuatu (fig. 306E). The specimen from NORFANZ station 126 (NMNZ CR.022685) agrees with previous descriptions: uniformly pale orange base colour, spines dark orange or red, distally white on pereopods and some abdominal spines (Fig. 161).

Remarks. The specimen (NMNZ CR.022697,

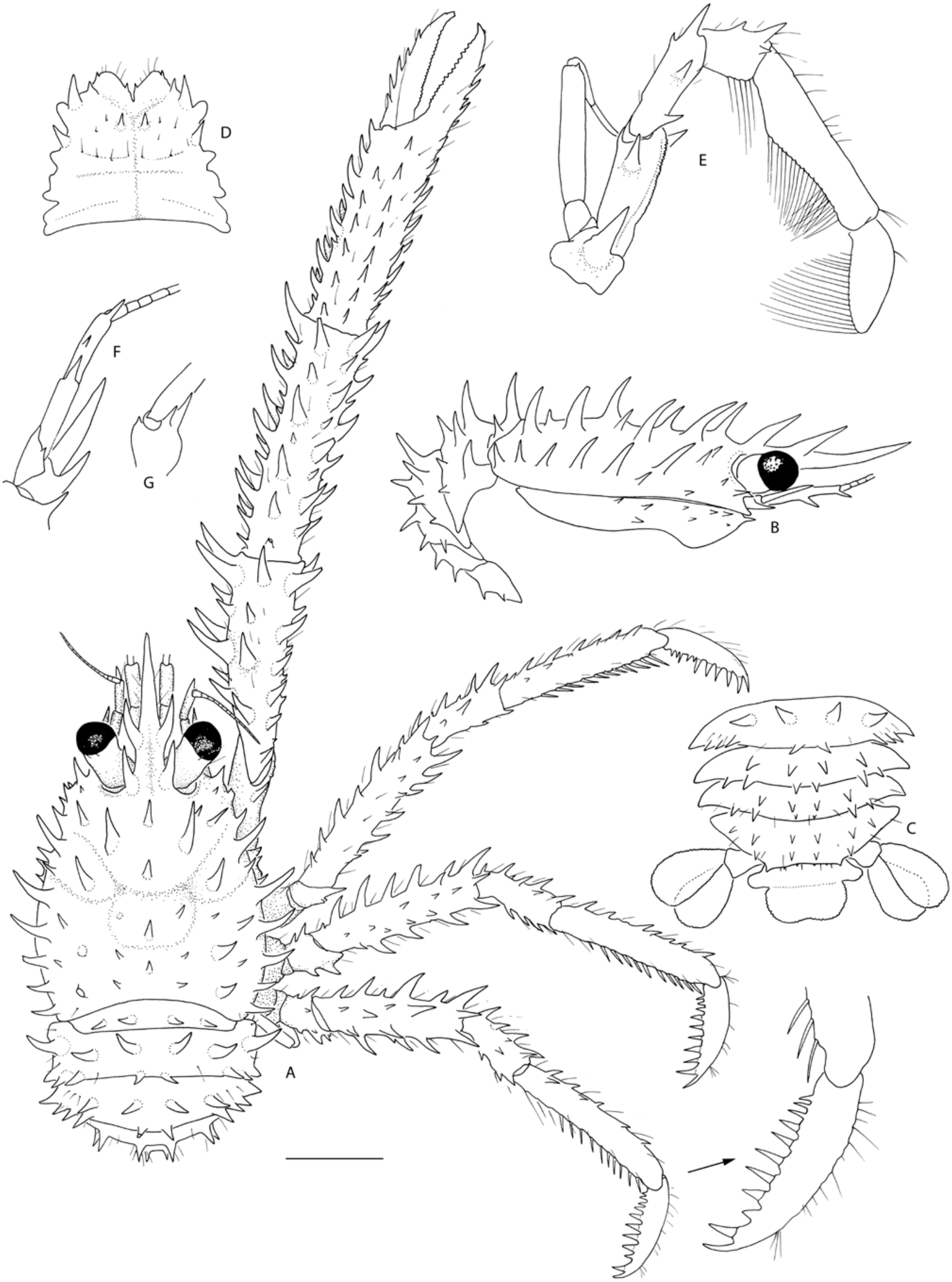


Figure 162. *Uroptychus spinirostris* (Ahyong & Poore, 2004), male holotype, cl 7.3 mm, AM P31418: **A.** dorsal habitus; **B.** right lateral; **C.** abdomen, extended, dorsal; **D.** sternal plastron; **E.** Mxp3, right lateral; **F.** antennal peduncle, left ventral; **G.** antennular article 1, left ventral. Scale A–D = 2 mm, E–G = 1 mm. After Ahyong & Poore (2004).

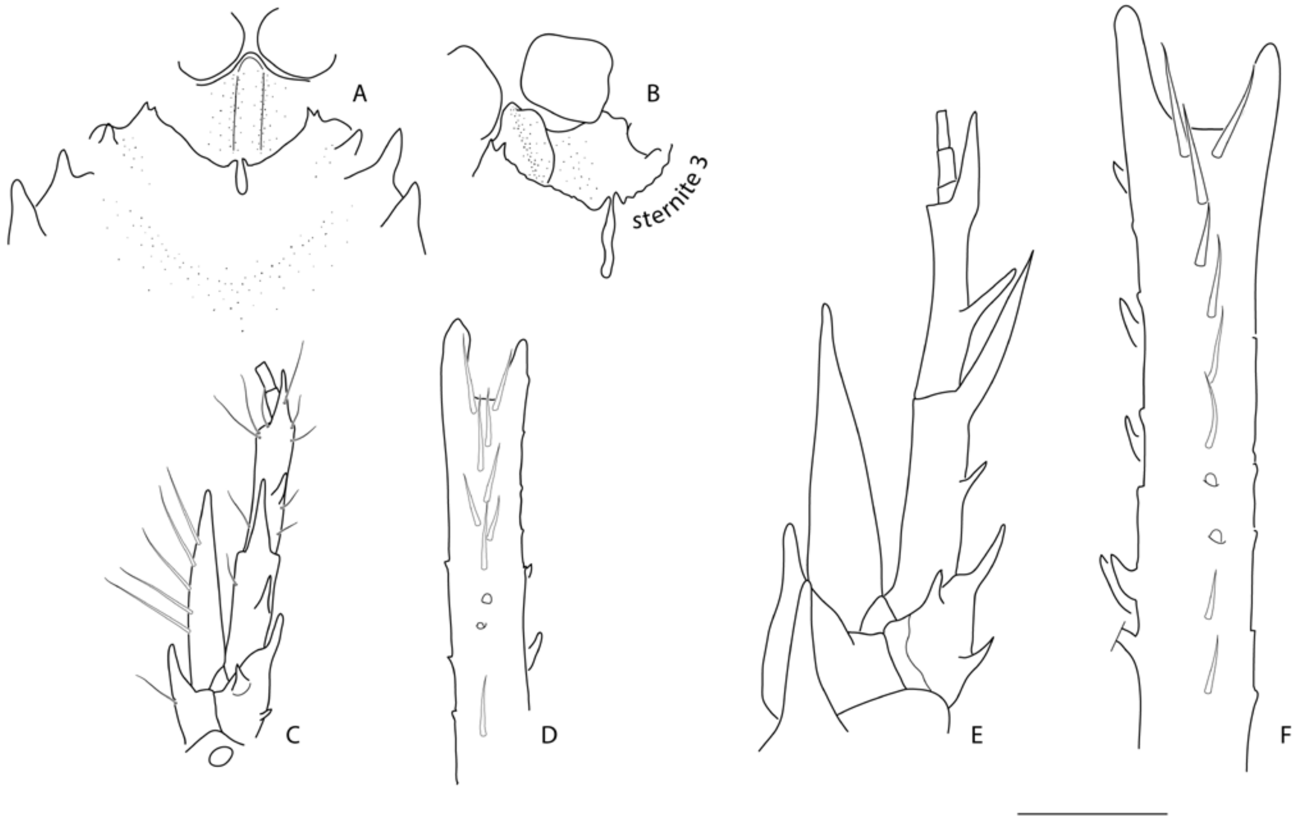


Figure 163. *Uroptychus spinirostris* (Ahyong & Poore, 2004), A–D, male, pcl 4.8 mm, NIWA 8992; E, F, female, pcl 11.7 mm, NIWA 14550: **A.** excavated sternum, sternite 3 and anterior portion of sternite 4, bases of Mxps1 included; **B.** coxa of Mxp1, excavated sternum and anterior portion of sternite 3, oblique view to show anterior median ridge on excavated sternum; **C, E.** antenna, right; **D**, **F.** distal flexor margin of propodus, P4, mesial. Scale = 1 mm.

male, pcl 2.7 mm) is the smallest record to date; the largest specimen (Poor Knights, NMNZ CR.025244, ov. female, pcl 12.5 mm) is comparable to those of the type series and Baba (2018) but none attain the size (pcl ~15.7 mm) reported by McCallum & Poore (2013) from Western Australia.

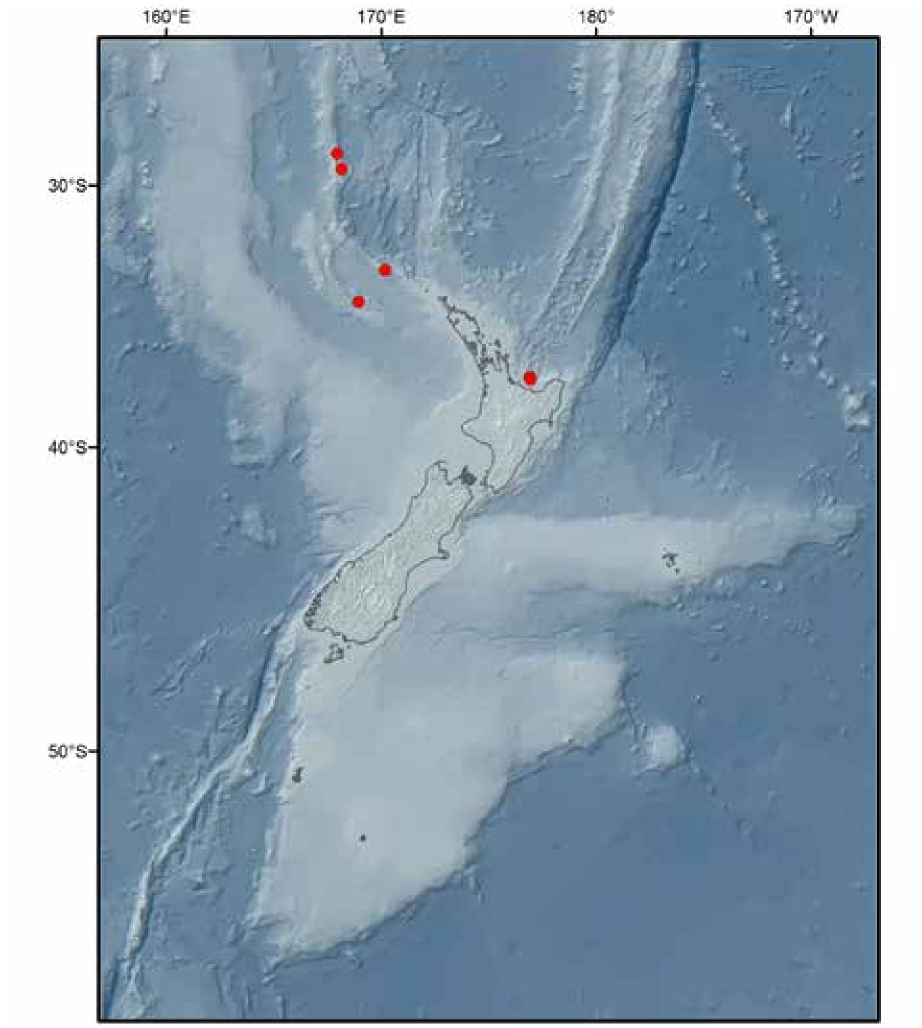
Two specimens successfully sequenced, from the northern West Norfolk Ridge (NMNZ CR.022697) and from the Bay of Plenty (NIWA 8992), reveal CO1 divergences of about 10%. The former appears more closely related to the Western Australia specimen examined by McCallum & Poore (2013, NMV J55996), albeit still with around 4.5% sequence divergence. There is clearly a strong degree of genetic divergence warranting further investigation but, unfortunately, the type material has been formalin-fixed and not successfully sequenced.

Morphological variation among the New Zealand specimens of *U. spinirostris* has been examined in detail but appears to be generally size-related. This includes meristics of the carapace, cheliped, and walking legs and the degree of setation of the carapace which increases with size; small specimens have a smooth integument; large specimens have the surfaces and the spines covered with fine setae. The degree of spination also increases with size; smaller specimens bear large spines on the carapace and abdomen, the larger specimens bear further scattered smaller spines inbetween the major spines. The rostrum bears either two or three lateral spines and ranges from 0.7–0.9 × pcl in smaller specimens to 0.6–0.7 × pcl in some larger specimens.

In the smallest specimens (NIWA 23782) the thoracic sternite 4 surface lacks the distinct pair of submedian spines, with only a few small scattered spines (notably, the large McCallum & Poore (2013) female has additional spines). The diagnostic spines on abdominal tergite 6 are small but discernible under high magnification.

The antennal article 3 was examined in more detail since it shows an unusual form compared to other congeners. All specimens have the three spines as illustrated by McCallum & Poore (2013); one large distomesial, one distolateral spine at the juncture with article 4 and one proximal spine along the mesial margin. The mesial spines are not apparent in the illustrations of the holotype from Queensland, Australia (reproduced in Fig. 162), and Shane Ahyong from the Australian Museum kindly re-examined the type material. He confirmed that the distomesial spine

Figure 164. Distribution of *Uroptychus spinirostris* (Ahyong & Poore, 2004) around New Zealand.



on the paratypes (both larger than the holotype) is larger than in the holotype, and somewhat intermediate between the holotype and McCallum & Poore's (2013) much larger figured specimen. However, the proximal spine appears to be absent, as is the median spine on article 4. An example of a smaller (pcl 4.8 mm NIWA 8992) and a larger New Zealand specimen (pcl 11.7 mm, NIWA 14550) are illustrated in Fig. 163. Spines on the antennal article 3 are unusual for *Uroptychus* and a distal spine is only shared with other 'spiny' species *U. ciliatus*, *U. numerosus*, *U. quartanus,* and *U. senarius*. The additional proximal spine is not present in any of the other species (see below).

The antennule was also examined in more detail since Ahyong & Poore (2004:·Fig. 162G) and McCallum & Poore (2013: fig. 8F) show a lateral spine absent and present on article 1, respectively. Comparing the morphology of the basal antennular article 1 across the 'spiny' species *U. spinirostris*, *U. numerosus*, *U. taratara* **sp. nov.**, *U. taniwha* **sp. nov.**, and *U. tracey*, none of them displayed a lateral spine. In the seven specimens of *U. spinirostris* examined here, the lateral margin had a small but distinct spine in all but one, the smallest specimen (NMNZ CR.022697). This character might hold more phylogenetic information and could provide some diagnostic characters that are worth examining in the future.

Finally, variability is also observed in the unusual distal armature of the Mxp3 propodus. The holotype Mxp3 propodus is unarmed (Ahyong & Poore 2004: Fig. 162E) and armed with a distodorsal spine in the Western Australian specimen (McCallum & Poore 2013: fig. 8G). The largest specimens examined here all clearly have 1 or 2 distal spines but, notably, the smallest specimen from the West Norfolk Ridge also has a spine. Both the Bay of Plenty specimens and one specimen from the Norfolk Ridge, however, have an unarmed propodus. Hence, the difference in this character cannot be considered to be the result of allometry. In some larger specimens the eyes are distinctively constricted at midlength, with the proximal portion of the ocular peduncle expanded, and the cornea appears dilated (e.g. NIWA 8992). The cheliped size ranges considerably (1.6–3.0 × cl; 2.4–5.1 × pcl) with the range similar for both males and females, generally shorter for smaller specimens and proportionately longer for larger specimens.

Uroptychus spinirostris is closely related to other spiny species that have a median notch flanked by submedian spines on thoracic sternite 3 and subequal distal spines on the P2–4 dactyli. This includes *U. numerosus*, *U. quartanus*, *U. ciliatus*, and *U. senarius*, of which the first one also occurs in the New Zealand region. *Uroptychus numerosus* can be distinguished from *U. spinirostris* by the rostrum morphology, with the former having a slightly longer (about the same length as the remaining carapace) rostrum which appears distally broad and not tapering, and furnished with 8 or 9 lateral spines (*U. spinirostris* has a rostrum between 0.6–0.9 × pcl that tapers to a point and bears 2 or 3 lateral spines only. *Uroptychus spinirostris* differs from *U. quartanus* and *U. senarius* in having more spinose abdominal somites, especially somite 6 that bears numerous spines instead of no spine. Additionally, the rostrum is typically longer (0.6–0.9 × pcl) in *U. spinirostris*, while it is at most slightly more than half that of the carapace in the other two. *Uroptychus ciliatus* differs from *U. spinirostris* in having small lateral spines and serrations on the rostrum (compared to 2 or 3 strong lateral spines in *U. spinirostris*), a single transverse row of small spines on the abdominal tergites (versus two rows of large spines, often interspersed with numerous scattered smaller spines), and comparably longer P2–4 carpi (0.8–0.9 × the propodus, at least in P2, versus about 0.5 ×).

The only other spinose species in New Zealand that also have spines on the abdomen are *U. numerosus* and *U. sadie* **sp. nov.** The former is discussed above, and the latter is easily distinguished from *U. spinirostris* by the absence of spines on abdominal tergites 4–6, antennal article 3 and sternite 4 surface, and by the P2–4 carpi that are less than half the length of the propodi.

The female collected from Rungapapa Knoll in the Bay of Plenty (NIWA 23782) is the shallowest record for this species to date, with the depth of 155–280 m.

DNA sequence data. Sequence divergences for partial CO1 gene: 9% (between New Zealand specimens NIWA 8992 and NMNZ Cr.022697). Two specimens sequenced from NMV J55996 (off NW Australia, 390 m) differ 4.2–4.9% from NMNZ CR.022697 specimen and 10.1–12.3% from NIWA 8992 (N. Andreakis, pers. comm.).

Uroptychus spinosior Baba, 2018 Figs 165, 166

Uroptychus spinosior Baba, 2018: 491, figs 246, 247.

Type & locality (not examined). Holotype—MNHN-IU-2011-5941, MUSORSTOM 7 Stn DW516, 14°13′S, 178°12′W, 441–550 m, Wallis and Futuna Islands, 12 May 1992, female ov. (pcl 3.5 mm).

Material examined. *Raoul Island*, *Kermadec Islands*: NMNZ CR.025245, NMNZ Stn BS 297, 28°45.0′S, 178°00.0′W, 172–179 m, 24 Aug 1972, 1 male (4.7 mm, pcl 3.0 mm); NMNZ CR.025246, RV *Acheron* Stn BS 313, 29°13.0′S, 177°59.8′W, 201–146 m, 5 Apr 1973, 1 male (5.3 mm, pcl 3.5 mm); NMNZ CR.015262, RV *Acheron* Stn 73310, 29°12.60′S, 177°56.80′W, 155–165 m, 4 Apr 1973, 1 male (4.1 mm, pcl 2.5 mm).

Kermadec Islands, *near Macauley Island*: AKM MA124693 (ex NIWA 119057), Kermadec-Rangitahua Stn TAN1612/103, 30°14.64–14.62′S, 178°20.05–19.91′W, 144–147 m, 31 Oct 2016, 1 female (5.1 mm, pcl 3.3 mm; sequenced, see Fig. 5).

Distribution. Fiji, Tonga, Wallis and Futuna Islands, 220–450 m; Kermadec Islands, 146–201 m (Fig. 166).

Habitat. Unknown.

Diagnosis. Carapace dorsal surface smooth, finely setose; strong anterolateral spine overreaching smaller lateral orbital spine; lateral margin with 12–18 spines along entire length. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines), with pair of subapical spines. Sternite 3 anterolaterally acute. Ocular peduncle distally narrowed. Antennal article 2 with distolateral spine, articles 4 and 5 each bearing long distal spine; antennal scale overreaching peduncle. Mxp3 endopod ischium with spine near distal end of flexor margin; merus strong distal spine and a few spines distal to midlength of flexor margin; carpus with distal and 1 proximal spine on extensor margin. P2–4 meri with dorsal row of spines; propodi with distal pair on flexor margin only, P2 occasionally with additional proximal spine; dactyli distally narrowed (not truncate), with 5–7 regularly arranged spines along flexor margin, ultimate much smaller than and close to penultimate, penultimate slightly broader than antepenultimate, remaining 3–5 proximal spines loosely arranged and perpendicular to flexor margin.

Colour in life. Collection notes during the Kermadec-Rangitahua voyage TAN1612 state "pale cream, red eyes".

Remarks. Slight variation for the New Zealand material of *U. spinosior* are as follows: the anterolateral corner of sternite 3 is not acute but more round in NMNZ CR.025245; the meri and carpi of cheliped bear distinct distodorsal granules and/or small spines in addition to the distomesial and distolateral spines; and the meri of P2–4 are more distinctly spinose with P2 and P3 bearing 6–8 strong spines, while P4 is serrated dorsally, and P2 and P3 meri also bear a distinct ventrodistal spine (Fig. 165), which is not mentioned in the original description.

Uroptychus spinosior aligns most closely with

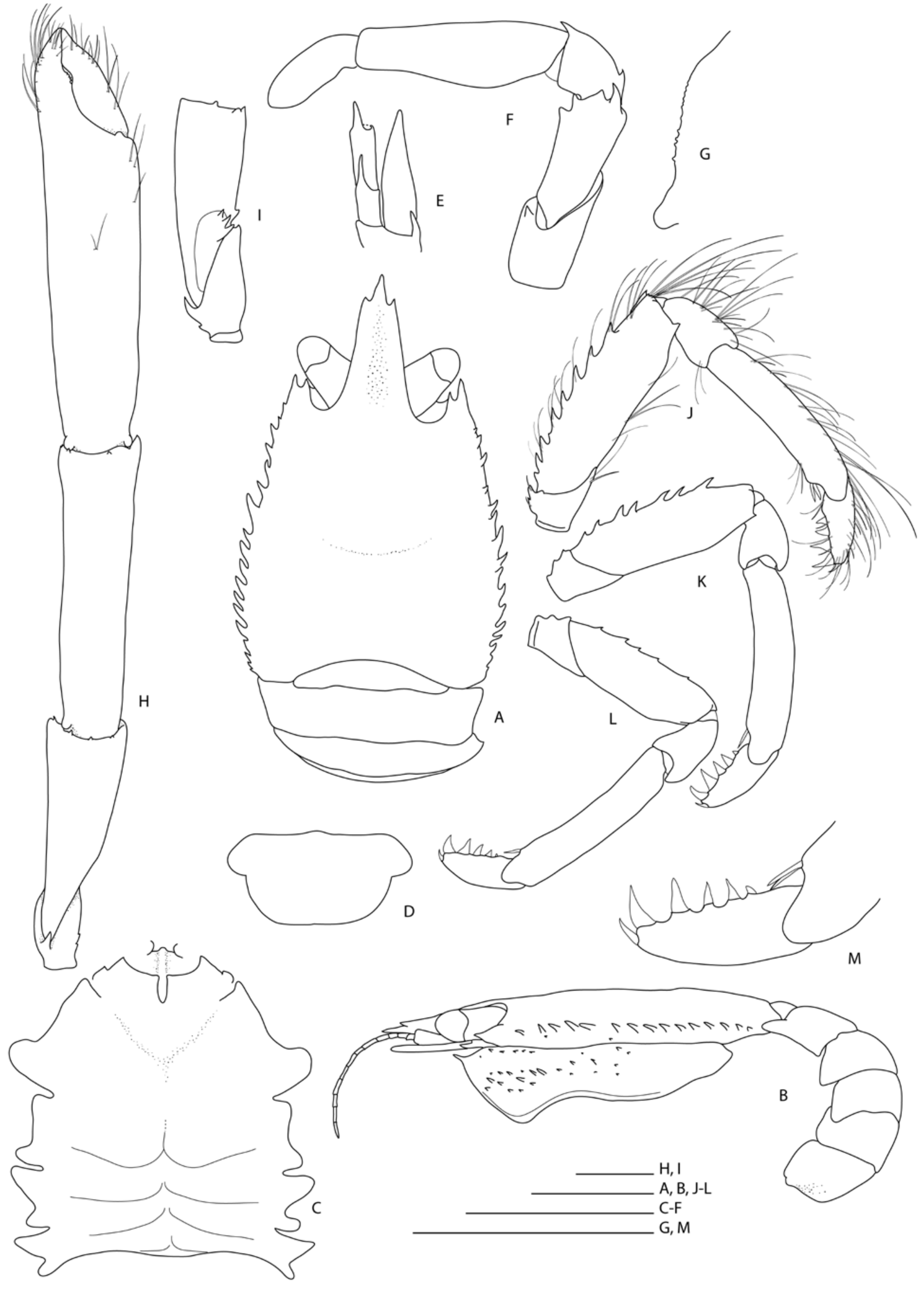
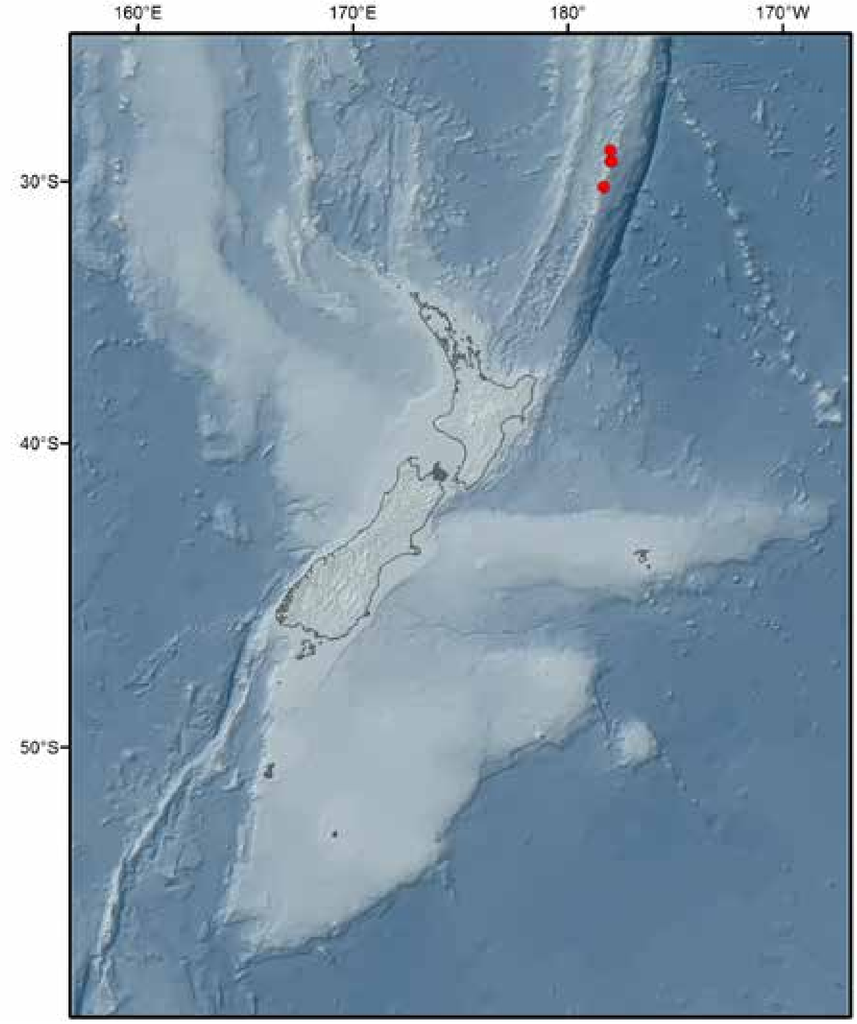


Figure 165. *Uroptychus spinosior* Baba, 2018, female ov. NMNZ CR.025246: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left Mxp3; **H.** left cheliped, dorsal; **I.** left cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** P2 distal propodus and dactylus, lateral. Scale bars = 2 mm.

Figure 166. Distribution of *Uroptychus spinosior* Baba, 2018 around New Zealand.



U. annae Baba, 2018 and *U. oxymerus* Ahyong & Baba, 2004 of which the former is also found in New Zealand waters. They share a rostrum bearing a pair of subapical spines, the lateral carapace margin bearing distinct spines, the sternal plastron with sub-parallel lateral margins, the antennal scale overreaching the antennal peduncle, the P2–4 propodi typically with only a distal pair of spines on the flexor margin (P2 or P3 may bear a small additional spine proximally), and the dactyli with less than eight spines along the flexor margin. *Uroptychus spinosior* can be distinguished from these species by the more numerous (12–18) spines along the entire lateral margin of the carapace, instead of at most seven spines with the posterior quarter irregular or unarmed. The New Zealand specimens have a more pronounced spination of the dorsal margin of P2–3 meri compared to the type material, but molecular sequencing indicates that the paratypes and the New Zealand material align (see below).

Uroptychus ahyongi **sp. nov.** is also similar to *U. spinosior* and these two are compared under the account of the species above.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene were revealed comparing female (AKM MA124693) and a sequence generated for paratypes of *U. spinosior* at the MNHN (L. Corbari, pers. comm.).

Uroptychus taniwha sp. nov. Figs 167, 168

Material examined. Holotype NMNZ CR.025247, NZOI Stn J680, 37°25.8′S, 177°11.75′E, Bay of Plenty, 328–352 m, 8 Sep 1974, female ov. (10.5 mm, pcl 7.3 mm).

Type locality. Bay of Plenty, 328–352 m.

Distribution. Known only from the type locality (Fig. 168).

Habitat. Also collected at this station were a range of large black corals (*Bathypathes*, *Saropathes*, *Stichopathes*), a scleractinian (*Goniocorella dumosa*), large rossellid glass sponges and hydroids, but there is no indication of an association of this species with any of these macroinvertebrates.

Diagnosis. Carapace dorsal and lateral margins entirely covered with spines. Rostrum narrow triangular, laterally with a few small spines, dorsally with scattered small spines. Abdominal somites unarmed but distinct transverse ridge on somite 1. Excavated anterior margin of sternite 3 with median

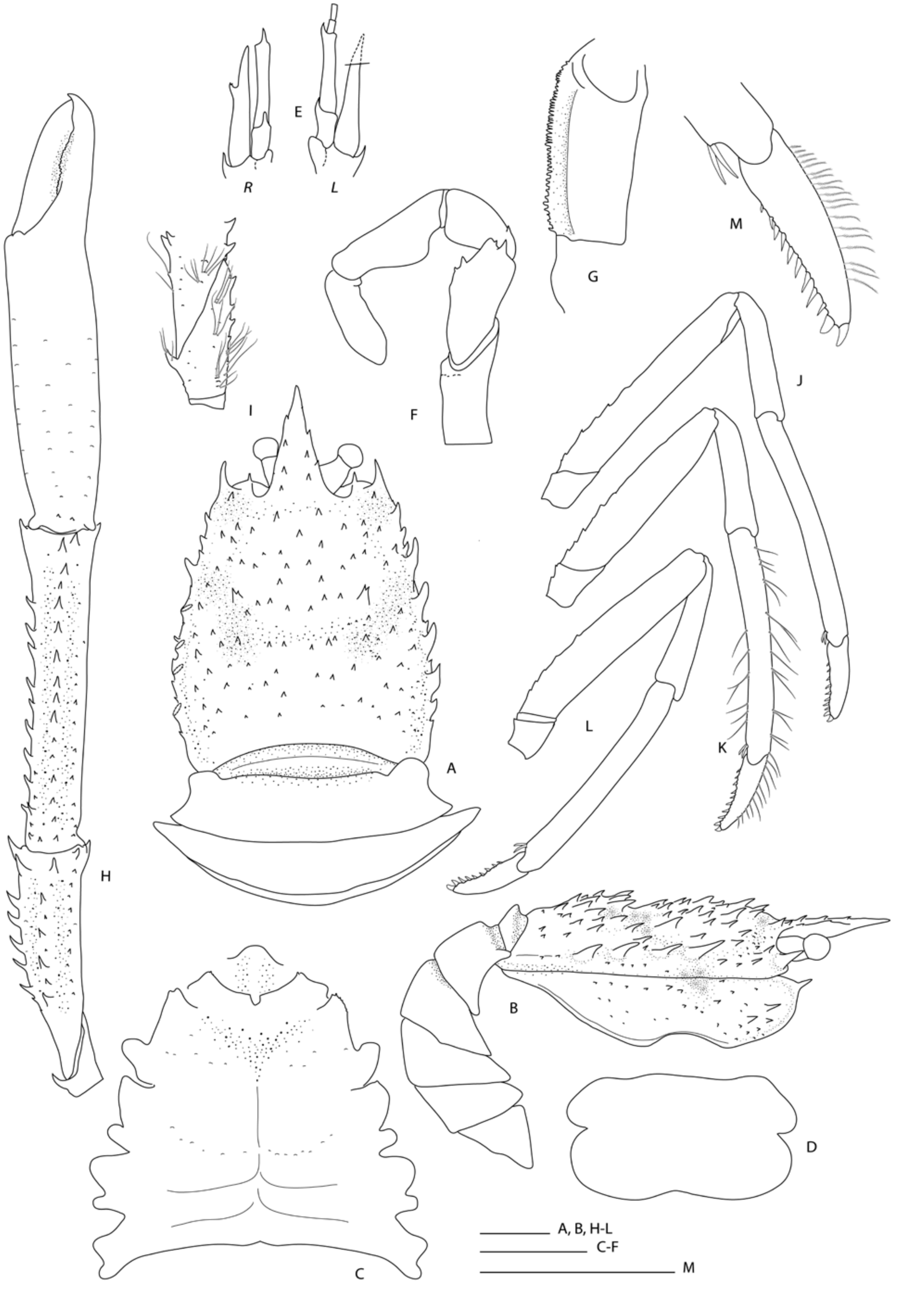


Figure 167. *Uroptychus taniwha* **sp. nov.**, holotype female ov., NMNZ CR.025247: **A.** carapace and abomen, dorsal; **B.** carapace and abdomen, lateral; **C.** sternal plastron; **D.** telson; **E.** antennae, right and left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata, left; **H.** right cheliped, dorsal; **I.** right cheliped, ischium and proximal portion of merus, mesial; **J–L.** right P2–4; **M.** P2 distal propodus and dactylus. Scale bars = 2 mm.

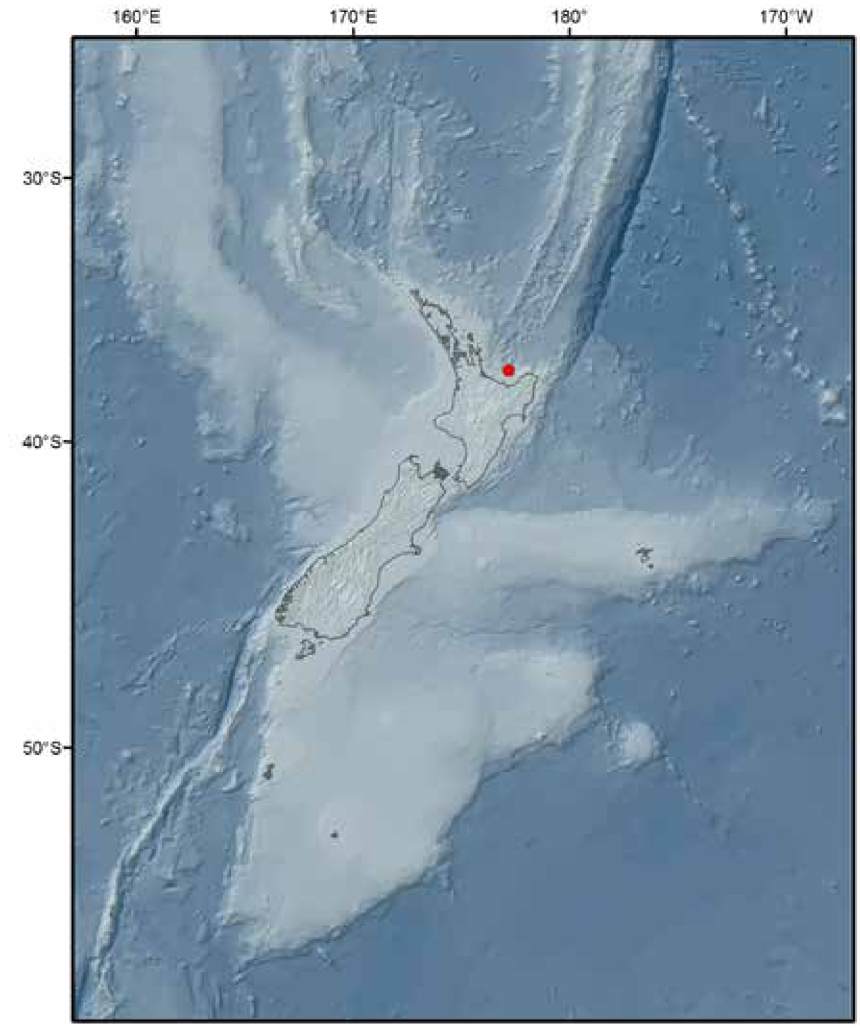


Figure 168. Distribution of *Uroptychus taniwha* **sp. nov.** around New Zealand.

notch lacking submedian spines. Antennal scale reaching end of peduncle. Cheliped spinose on merus and carpus, palm smooth. P2–4 elongate and slender, P2 merus length 0.9 × pcl, propodi length around 10 × width, unarmed meri and carpi; propodi with distal pair of movable spines only; dactyli tapering distally; with 10 or 11 inclined sharp triangular spines, loosely arranged along entire length; ultimate spine subequal in size to penultimate, both more than twice broader than remaining proximal spines; extensor margin with row of plumose setae.

Description. Carapace: As long as wide, shallow convex from side to side. Dorsal surface entirely scattered with small spines, a pair of bifurcate postcervical spines most pronounced; cervical groove not deep but distinct. Lateral orbit produced into small spine. Anterolateral spine well-developed, overreaching lateral orbital spine; lateral carapace margins subparallel, slightly wider posteriorly; with around 4–5 large spines excluding anterolateral spine, interspersed with smaller spines: 3 small hepatic; 1 large anterior branchial (most prominent lateral spine); 3 or 4 posterior branchial spines. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines), horizontal, 0.5 × pcl; dorsal surface with small scattered spines on posterior two-thirds; lateral margins irregular, with 1–2 very small lateral spines or large tubercles each. Pterygostomian flap surface covered with spines; anterior margin produced into spine.

Thoracic sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron 1.3 × as wide as long, slightly widening posteriorly; surface smooth. Sternite 3 anterolaterally produced; anterior margin with median notch, without submedian spines; lateral margins lacking distinct spine at lateral terminus. Sternite 4 1.9 × as wide as sternite 3, surface with indistinct median transverse row of setae; anteriorly with V-shaped depression, midline grooved; anterolateral margin produced, ending in 1 or 2 teeth, not overreaching sternite 3; laterally unarmed.

Abdomen: Tergites smooth and unarmed. Tergite 1 with sharp ridge at posterior margin; tergites 2–4 without transverse ridges or grooves. Pleural margins of somites 2–4 distally narrowing to triangular point. Telson 1.9 × as broad as long; posterior margin emarginated; posterior portion 1.4 × length of anterior portion.

Eyes: Smooth. Cornea distally dilated, 'club'-like, clearly constricted behind cornea, 0.5 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine. Article 3 unarmed. Article 4 with distinct distal spine; mesial margin unarmed. Article 5 armed with distinct distomedian spine; mesial margin unarmed; 2.3–2.5 × as long as article 4. Antennal scale reaching end of peduncle; 4.8–5.1 × as long as wide, lateral spine present or absent.

Maxilliped 3: Coxa unarmed. Basis smooth along mesial ridge. Ischium without distal spines; crista dentata with fine teeth along entire length, successively finer towards distal portion. Merus extensor margin with two distal spines; flexor margin with two spines distal to midlength. Carpus with proximal spine on extensor margin, otherwise unarmed.

Cheliped: Subcylindrical; nearly 5 × pcl; surface spinose except for palm and fingers. Ischium with strong dorsal and small ventral spines distally and ventromesial row of proximally diminishing spines. Merus surface strongly spinose, with 4 rows of larger spines interspersed with small spines and tubercles and covered with dense long setae; with 5 distal spines. Carpus surface with 4 longitudinal rows of spines; with 3 distal spines; length 1.1 × that of palm. Palm 3.4 × as long as wide, unarmed, with long setae. Dactylus 0.5 × as long as propodus; occlusal margins denticulate, without gape.

Pereopods 2–4: Slender; surface smooth. Merus dorsal margin proximally irregular but unarmed; ventral margin without spines; 1.0–0.9 × as long as propodus, shortening slightly from P2–P4, shortest on P4; P2 merus 0.9 × length of pcl. Carpus unarmed. Propodus very slender, 9–11 × longer than wide; extensor margin smooth; flexor margin nearly straight, with only distal pair of spines; 3.2–2.8 × as long as dactylus. Dactylus nearly straight; flexor margin with 10 or 11 movable spines along distal three-quarters, all sharp triangular, loosely and regularly arranged, ultimate spine subequal size to penultimate, penultimate slightly stouter, remaining proximal spines slender; extensor margin with row of plumose setae.

Etymology. Named *taniwha*, a mythical sea creature of Māori legend, referring to the spiny appearance and long slender legs of this new species. Used as a noun in apposition.

Colour in life. Not known.

Remarks. *Uroptychus taniwha* **sp. nov.** is known only from the holotype, but the characteristics clearly identify it as a new species. The combination of the spinose carapace and rostrum, the unarmed abdomen, the slender and mostly unarmed walking legs with dactyli that have two subequally-sized distal spines are diagnostic (Fig. 167). The club-like ocular peduncle, constricted behind the cornea, is also not common for the genus *Uroptychus* but it is possible that this has occurred due to preservation, as the specimen is old and not well preserved.

Uroptychus taniwha **sp. nov.** is most similar to *U. fusimanus* Alcock & Anderson, 1899, collected by the RIMMS *Investigator* off the Travancore coast, southwestern India. Based on the description (Alcock & Anderson 1899a) and illustrations (Alcock & Anderson 1899b), the dorsal carapace armature appears to be more pronounced in *U. fusimanus*, particularly in the epigastric region and with two distinct submedian rows of cardiac spines, and the lateral and dorsal surface of the rostrum is smooth. *Uroptychus taniwha* **sp. nov.**, in contrast, has a carapace furnished with smaller spines that are not arranged in rows, and the rostrum bears a few lateral marginal and scattered small dorsal spines. The cheliped palm for *U. fusimanus* is noted as "smooth, broadened, the edges of the palm almost cristiform" (Alcock & Anderson 1899a: 26), and while the specimen illustrated in Alcock & Anderson (1899b: pl. 44, fig. 4) is most likely slightly larger than the New Zealand specimen, this character is entirely absent in *U. taniwha* **sp. nov.** Presenting the same *Investigator* material, Alcock (1901) added that the P2–4 propodi only bear a single distal spine, but *U. taniwha* **sp. nov.** has a pair. This and other characters will need to be verified, but access to any material housed in the Zoological Survey of India, Calcutta, is notoriously difficult.

In New Zealand, *U. taniwha* **sp. nov.** most closely resembles *U. taratara* **sp. nov.** and differences are discussed under the account of that species.

NZOI Stn J680 in the Bay of Plenty has two records of chirostylids, both being rare new species, *U. rungapapa* **sp. nov.** and *U. taniwha* **sp. nov.**, each represented by a single specimen.

ZooBank registration. *Uroptychus taniwha* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:FFFE8365-5F27-4267-B310-2B3C64E8DEB0.

Uroptychus taranaki sp. nov.

Figs 169, 170, 177 C, J, K

Material examined. Holotype NMNZ CR.025248, NMNZ Stn BS314, eastern edge of Challenger Plateau, on shallow continental shelf due west of Mount Taranaki, 39°22.00′S, 171°49.99′E, 230–251 m, 25 Oct 1960, female (12.5 mm, pcl 8.5 mm). **Paratype** NIWA

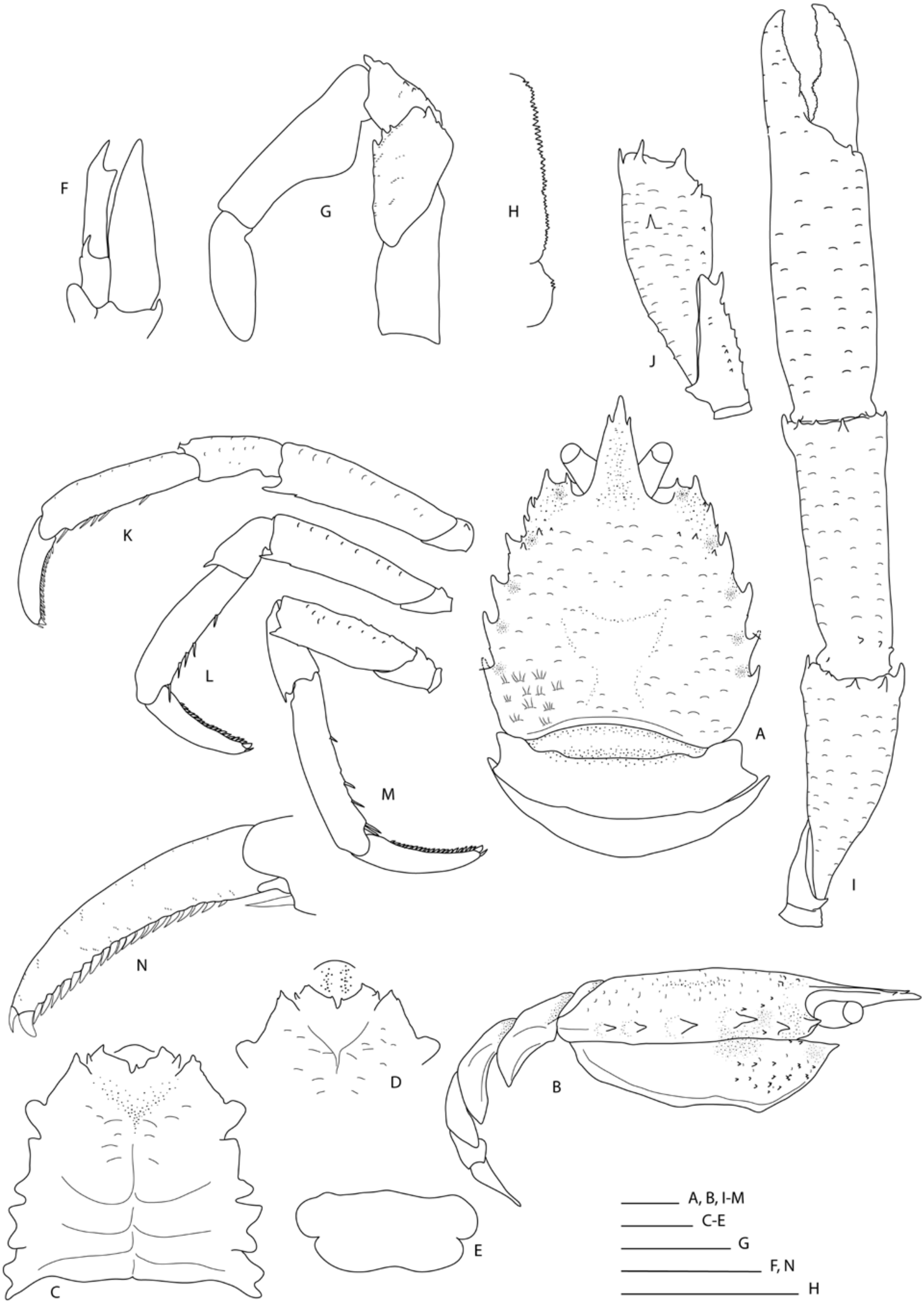


Figure 169. *Uroptychus taranaki* **sp. nov.**; A–C, E–N, holotype, female, NMNZ CR.025248; D. paratype, female ov., NIWA 135604: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** excavated sternum and sternites 3–4; **E.** telson; **F.** antenna, left, ventral; **G.** endopod of Mxp3, left, lateral; **H.** crista dentata of right Mxp3; **I.** left cheliped, dorsal; **J.** left cheliped, ischiomerus, mesial; **K–M.** right P2–4; **N.** P4 distal propodus and dactylus. Scale bars = 2 mm.

135604, same locality as holotype, 1 female ov. (11.1 mm, pcl 7.3 mm).

Type locality. Eastern edge of Challenger Plateau, due west of Mount Taranaki, 230–251 m.

Distribution. Only known from the type locality (Fig. 169).

Habitat. Unknown.

Diagnosis. Carapace lateral margin with distinct spines, other than anterolateral spine, 4 prominent branchial spines; lateral orbital spine much smaller than anterolateral spine; dorsal surface covered with short setiferous ridges, armed with 2 pairs of small hepatic spines. Rostrum narrow triangular; with pair of subapical spines. Pterygostomian flap strongly produced anteriorly. Anterior margin of sternite 3 with distinct notch and submedian spines. Anterolateral corner of sternite 4 produced to prominent spine; posterolateral margin of sternite 4 shorter than anterolateral margin. Antennal scale overreaching peduncle. Cheliped merus with a few mesial spines; carpus surfaces unarmed. P2–4 meri unarmed except for prominent distoventral spine; carpi with single distal spine only; propodi extensor margins smooth, flexor margins nearly straight, with 3 or 4 spines in addition to distal pair; dactyli tapering distally, P4 dactylus 1.5 × length of P4 carpus; all dactyli with penultimate flexor marginal spine prominent, much broader than antepenultimate and ultimate, preceded by 15–21 inclined spines, closely arranged, at least in distalmost group.

Description. Carapace: pcl 0.8 × width, moderately convex from side to side. Dorsal surface setose, unarmed except for 2 or 3 small spines in hepatic region; cervical groove indistinct (faintly indicated). Lateral orbital spine small. Anterolateral spine well-developed, overreaching lateral orbital spine; lateral carapace margins convexly divergent posteriorly; with 7 or 8 large spines excluding anterolateral spine: 3 or 4 small hepatic, 1 anterior branchial region followed by small tubercles or irregular margin, 3 posterior branchial spines; anterior branchial largest. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines), horizontal, 0.5 × pcl; dorsally excavated; lateral margins with pair of subapical spines, otherwise smooth. Pterygostomian flap surface covered with small spines in anterior portion; anterior margin produced into spine.

Thoracic sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron 1.1 × as wide as long, sternites 5–7 laterally subparallel, very slightly divergent posteriorly. Sternite 3 anterolaterally acute; median notch present with submedian spines; small spine at lateral corner. Sternite 4 2.4 × as wide as sternite 3, surface with scattered short setiferous striae; anteriorly depressed in deep V-shape, midline grooved; anterolateral margin produced to spine, not overreaching sternite 3, with or without flanking tubercle laterally, margin otherwise is smooth; slightly longer than posterolateral margin.

Abdomen: Tergites covered with short, fine, scattered setae, unarmed; all tergites without ridges. Pleural margins of somites 2–4 distally narrowing to triangular point. Telson 2.2 × as broad as long; posterior margin emarginated; posterior portion 0.8 × length of anterior portion.

Eyes: Smooth, distally narrowing. Cornea subglobular, 0.4 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine. Article 3 unarmed. Article 4 with large distal spine, about 0.5 × length of peduncle; mesial margin unarmed. Article 5 armed with large distomedian spine; mesial margin unarmed; 1.8 × as long as article 4. Antennal scale overreaching and much wider than peduncle; 3.6 × as long as wide.

Maxilliped 3: Coxa only with small distolateral spine. Basis with a few small median denticles along mesial ridge. Ischium without distal spines; crista dentata with 43 denticles. Merus with distolateral spine; flexor margin with 3 spines distal to midlength. Carpus with distal spine and a few setiferous ridges along on extensor margin, otherwise unarmed.

Cheliped: Stout; 4.0 × pcl; entirely covered with setiferous ridges. Ischium with dorsal and ventral spines distally and with row of spinules on ventromesial margin. Merus with tubercles and scattered spines along mesial surface, with small ventral spines and one distinct mesial spine at about mid-length, and 6 distal spines. Carpus surface sparsely tuberculate; with six distal spines; length 0.9 × that of palm. Palm 2.7 × as long as wide, setose. Dactylus 0.5 × as long as propodus; occlusal margins denticulate, without gape.

Pereopods 2–4: Similar; surface setose, covered with short setiferous striae. Merus dorsal margins unarmed, slightly crenulate at most; ventral margins with strong distal spine; 1.0–0.7 × as long as propodus, shortening from P2 to P4 (P4 merus 0.7 × P2 merus). Carpus dorsal margin with distal spine on dorsal crest, otherwise unarmed. Propodus 3.3–3.5 × longer than wide; flexor margin straight, with 3 or 4 spines along distal 0.6 portion, in addition to distal pair; 1.5–1.4 × as long as dactylus. Dactylus nearly straight, longest on P4 (1.3 × length of P2 dactylus), around 1.5 × length of P4 carpus; flexor margin with 17–21 sharp triangular spines, closely and obliquely arranged along entire length; ultimate spine slender, subequal in breadth to antepenultimate; penultimate spine prominent, more than twice as broad as ultimate.

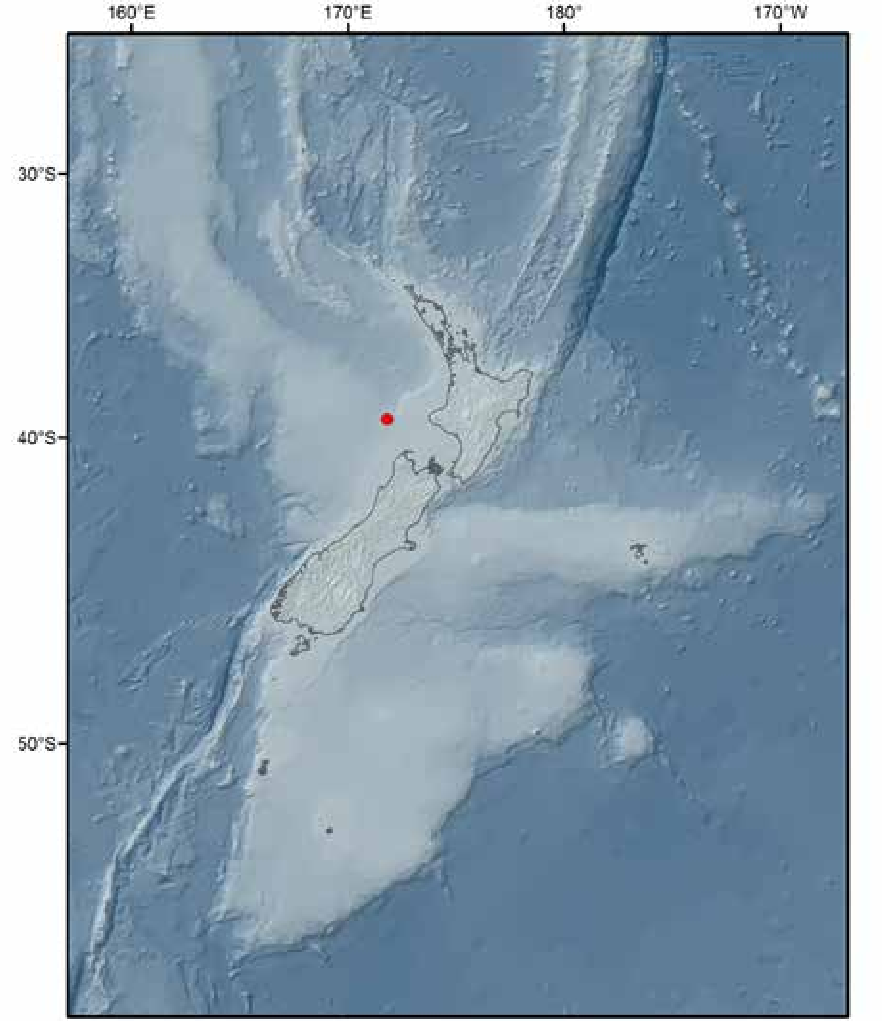


Figure 170. Distribution of *Uroptychus taranaki* **sp. nov.** around New Zealand.

Colour in life. Not known.

Etymology. Named *taranaki* after the region surrounding Mount Taranaki, on the west-central North Island of New Zealand. This species was collected on the eastern margins of the Challenger Plateau and the shallow continental shelf eastwards towards Mount Taranaki. Used as a noun in apposition.

Remarks. The female holotype of *U. taranaki* **sp. nov.** has a broken right cheliped finger, and left cheliped, P4 and right P2 and P4 are detached. The slightly smaller female paratype (ovigerous) from the same station matches the holotype with respect to morphometrics and spination in most cases. Differences are as follows: the propodi of P2 and P3 have seven spines along the flexor margin (eight in the holotype); the dactyli have less spines along the flexor margin (15 or 16 versus 17–21) (Fig. 169). Unfortunately, the paratype specimen has a dorsally damaged carapace in the cardiac region and the left cheliped is broken along the palm.

Uroptychus taranaki **sp. nov.** is close to the group of species with distinct lateral carapace spines, a set of subapical rostral spines, robust appendages and spines on the Mxp3 and antennal peduncle. This includes *U. tasmani* **sp. nov.**, *U. chathami* **sp. nov.**, and *U. taranui* **sp. nov.** A comparison of some key morphological characters and leg morphologies for all of these species is presented in Fig. 177 and Table 1 (pages 262, 263). *Uroptychus taranaki* **sp. nov.** is distinct from these in having four branchial spines along the lateral carapace margin (five spines in *U. taranaui*, six in *U. tasmani*, and two in *U. chathami* **sp. nov.**) and in having the P2–4 meri being dorsally unarmed.

Uroptychus taranaki **sp. nov.** also clearly aligns with *U. crassipes* van Dam, 1939 from Indonesia and the Philippines and *U. micrommatus* Baba, 2018 from Indonesia and Solomon Islands, but *U. taranaki* **sp. nov.** differs from both of these by the presence of a distal spine on the P2–4 carpi; and the strong ventrodistal spine on the P2–4 meri (absent in *U. micrommatus*). In addition, *U. taranaki* **sp. nov.** differs from *U. crassipes* in having a dorsal carapace surface with setiferous ridges and hepatic spines (versus smooth and unarmed), and in having the pterygostomian flap anteriorly covered with small spines (versus smooth).

In the key to New Zealand species of *Uroptychus*, *U. taranaki* **sp. nov.** pairs with *U. koningen* **sp. nov.**, primarily because of the shared characteristics of the walking legs. The material examined for both of these species differs greatly in size: *U. taranaki* **sp. nov.** specimens have a pcl of 7.3 and 8.5 mm while the two specimens for *U. koningen* **sp. nov.** are 2.5 and 3.7 mm; *U. taranaki* **sp. nov.** has a distinctly convex lateral carapace margin with four prominent branchial spines, while *U. koningen* **sp. nov.** has nearly sub-parallel lateral carapace margins with four small branchial spines; *U. taranaki* **sp. nov.** has the P2–4 meri and carpi distal spines (versus entirely unarmed); and *U. taranaki* **sp. nov.** has the antennal article 4 with a prominent distal spine (versus a small spine).

ZooBank registration. *Uroptychus taranaki* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:48240008-4A2C-4419-AF29-4EB96934AECD.

Uroptychus taranui sp. nov.

Figs 171, 172, 177 D, L, M

Material examined. Holotype NMNZ CR.025254, NMNZ Stn 76561, 41°24′S, 174°33′E, Cook Strait, 256–274 m, 26 Sep 1976, female (10.0 mm, pcl 6.7 mm). **Paratypes** *Otago Shelf*: NMNZ CR.025255, same locality as holotype, 7 females ov. (10.7, 9.9, 9.1, 9.1, 8.9, 8.4, 8.0, 6.6 mm, pcl 7.2, 6.2, 5.6, 5.5, 5.4, 5.4, 5.0, 4.0 mm); NMNZ CR.025256, same locality as holotype, 1 male (10.7 mm, pcl 6.8 mm); NMNZ CR.025257, same locality as holotype, 3 males (10.7, 10.0, 7.0 mm, pcl 6.5, 6.2, 4.2 mm); NIWA 123242, same locality as holotype, 1 female ov. (7.2 mm, pcl 4.4 mm), 1 male (7.0 mm, pcl 4.2 mm).

Other material. *Norfolk Ridge (International Waters)*: NIWA 88649, SOP Stn TRIP3933/29, 33°25′S, 167°36′E, 277–375 m, 12 Nov 2013, 1 male (4.0 mm, pcl 2.1 mm).

Three Kings Ridge (International Waters): NIWA 23365, NZOI Stn U594, 30°20.10′S, 172°59.60′E, 406–406 m, 7 Feb 1988, 1 male (6.0 mm, pcl 5.6 mm).

Three Kings Islands: NMNZ CR.025266 (ex CR.021587), NMNZ Stn MoNZ/MARS 3K/011, 34°7.33′S, 171°56.45′E, 544 m, 11 Mar 2010, fish trap, 1 male (9.5 mm, pcl 5.9 mm).

Northern Wanganella Bank (Australian EEZ): NIWA 23362, NZOI Stn I96, 32°10.80′S, 167°21.20′E, 356 m, 25 Jul 1975, 1 female ov. (6.4 mm, pcl 3.9 mm), 1 male (5.4 mm, pcl 3.1 mm); NIWA 23361, NZOI Stn E861, 32°25.00′S, 167°34.99′E, 318–383 m, 18 Mar 1968, 1 male (7.5 mm, pcl 4.8 mm);

Norfolk Ridge (International Waters): NMNZ CR.025259, NZOI Stn E865, 32°41.00′S, 167°36.00′E, 168–168 m, 1 female ov. (6.9 mm, pcl 4.4 mm); NMNZ CR.015250, NZOI Stn O635 (NMNZ StnBS889), 32°41.30–41.50′S, 167°38.10–35.80′E, 296–206 m, 30 Jan 1981, trawl, 1 male (6.0 mm, pcl 3.5 mm).

Reinga Ridge: NMNZ CR.025265, NORFANZ Stn TAN0308/126, 33°23.41′S, 170°11.58′E, 490–526 m, 1 female (7.9 mm, pcl 4.9 mm).

Bay of Plenty: NMNZ CR.015257, NZOI Stn R81, 37°35.90–37.60′S, 176°59.50–59.80′E, 179–139 m, 20 Jan 1979, 1 female ov. (9.5mm, pcl 6.0 mm).

Cook Strait: NMNZ CR.023797, NMNZ Stn 76561, same locality as holotype, 2 males (6.9, 4.0 mm, pcl 4.0, 2.4 mm); NMNZ CR.023805, NMNZ Stn 76561 same locality as holotype, 2 females ov. (9.9, 8.0 mm, pcl 6.2, 5.0 mm), 1 male (9.4 mm, pcl 6.1 mm); NMNZ CR.025258, NMNZ Stn D896.2, 44°20.00′S, 175°50′W, 106–106 m, 1 female ov. (6.2 mm, pcl 3.8 mm), 1 male (8.0 mm, pcl 5.0 mm).

Chatham Rise: NIWA 23364, NIWA Stn KAH0108/21 Z10929 43°7.26′S, 175°49.14′E, 438–467 m, 4 Sep 2001, 1 female ov. (10.0 mm, pcl 6.1 mm); NIWA 106417, NZOI Stn Q341, 44°07.10′S, 176°19.20′E, Veryan Bank, 264 m, 14 Nov 1979, 1 female (11.2 mm, pcl 7.0 mm); NIWA 33655, NIWA Stn TAN0705/4, 44°10.93′S, 175°21.47′E, 536–539 m, 1 female ov. (8.6 mm, pcl 5.5 mm; sequenced, see Fig. 5); NMNZ CR.025249, NZOI Stn J59, 43°51.00′S, 179°25.00′E, 309–309 m, 1 male (8.8 mm, pcl 5.8 mm); NMNZ CR.025250, NZOI Stn J59, 43°51.00′S, 179°25.00′E, 309–309 m, 1 female (7.6 mm, pcl 3.9 mm); NMNZ CR.025251, NZOI Stn J55, 44°5.50′S, 176°12.00′E, 198–198 m, 1 male (10.0 mm, pcl 6.2 mm); NMNZ CR.025253, NZOI Stn J55, 44°5.50′S, 176°12.00′E, 198–198 m, 1 female ov. (12.0 mm, pcl 7.9 mm); NMNZ CR.025252, NZOI Stn J55, 44°5.50′S, 176°12.00′E, 198–198 m, 1 female ov. (11.0 mm, pcl 7.0 mm).

Chatham Rise, *Andes Seamount Complex*, *Iceberg Seamount*: NIWA 60526, NIWA Stn TAN0905/119, 44°9.49′S, 174°33.30′W, 487–616 m, 1 male (12.0 mm, pcl 7.8 mm; sequenced, see Fig. 5); NIWA 23368, NZOI Stn Q38, 44°24.80′S, 176°43.60′W, 345–345 m, 1 female (11.9 mm, pcl 7.5 mm).

Type locality. Cook Strait, 256–274 m.

Distribution. From West Norfolk Ridge and Three Kings Ridge south to Chatham Rise, 106–539 m (Fig. 172).

Habitat. Unknown.

Diagnosis. Body setose. Carapace slightly wider than long; lateral margins with prominent anterolateral spine, much larger than lateral orbital spine; 2 or 3 small lateral hepatic spines; 1 prominent anterior branchial spines, four strong posterior branchial spines of subequal size; dorsal surface armed with a few spines and at most a few granules on hepatic region. Rostrum narrow triangular, with pair of subapical spines.

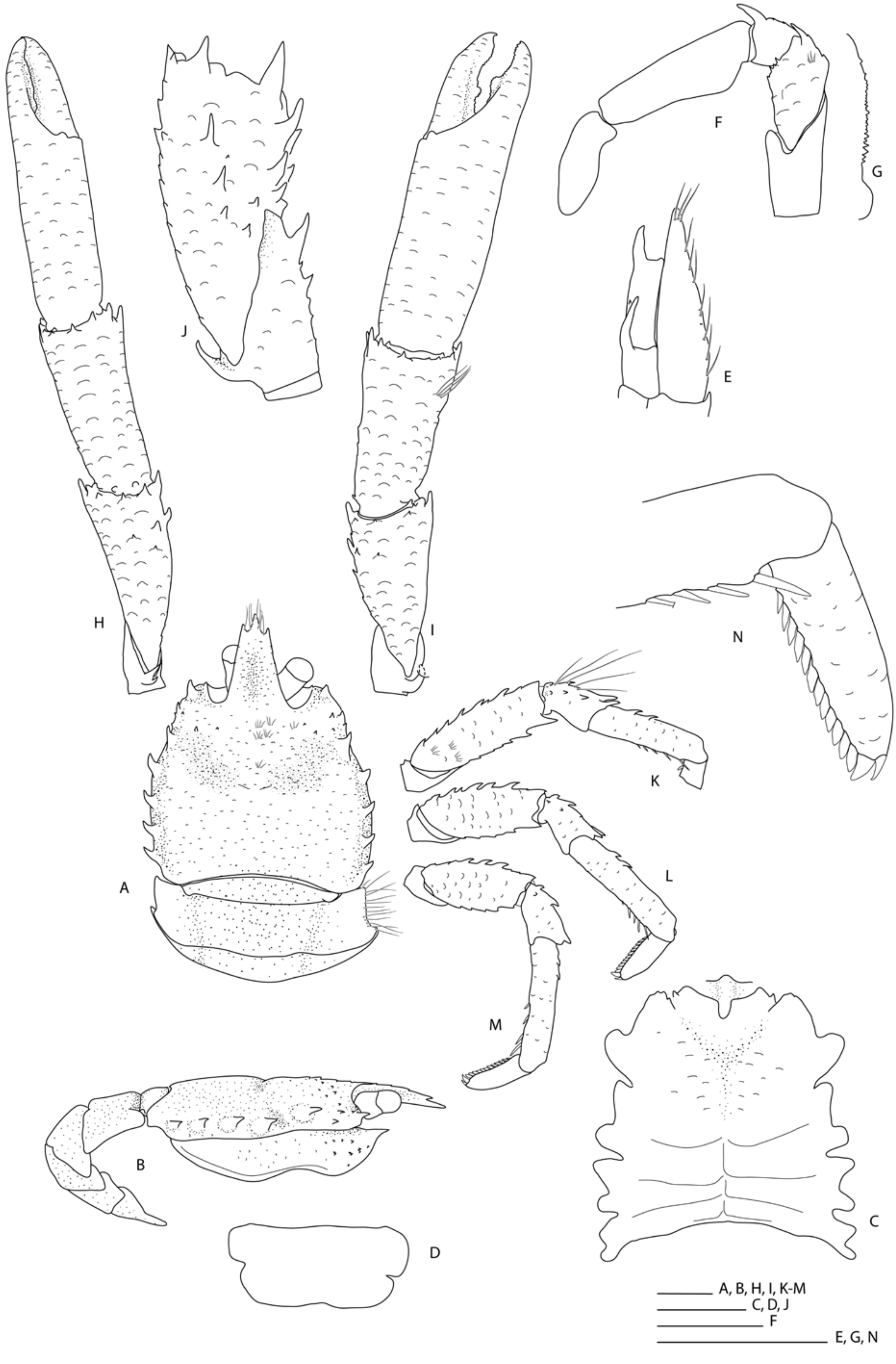


Figure 171. *Uroptychus taranui* **sp. nov.**, holotype female, NMNZ CR.025254: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of left Mxp3; **H.** left cheliped, dorsal; **I.** right cheliped, dorsal; **J.** left cheliped, ischiomerus, mesial; **K–M.** right P2–4; **N.** P3 distal propodus and dactylus. Scale bars = 2 mm.

Abdomen smooth, without ridges. Anterior margin of thoracic sternite 3 with deep U-shaped notch, without submedian spines; sternite 4 anterolateral margin rounded, about as long as posterolateral margin. Antennal articles both with distal spines, spine on article 4 very long (same size as article, reaching midlength of article 5); scale overreaching peduncle. Mxp3 ischium unarmed distally; merus and carpus with long distodorsal spine each, carpus at most with small granules along extensor margin. Cheliped granulose and setose, surfaces of carpus and palm unarmed, merus with prominent mesial and ventral spines, only a few small spines at most on dorsal surface. P2–4 meri with dorsal and ventral spines, carpi with two rows of dorsal spines, propodi extensor margin with two proximal spines; dactyli proportionally broad, slightly longer than carpi; with row of 13–17 relatively short, nearly contiguous and inclined spines, ultimate spine smallest, penultimate broadest, nearly double width of antepenultimate.

Description of holotype. Carapace: pcl [0.8]–0.9 × width, moderately convex from side to side. Dorsal surface covered with long fine setae; hepatic region with a few small spines and a few granules, otherwise unarmed; cervical groove not deep but distinct. Lateral orbital spine small. Anterolateral spine well-developed, set posterior to lateral orbital spine and slightly overreaching its apex; lateral carapace margins convexly divergent posteriorly, with 7 or 8 spines excluding anterolateral spine: 2 or 3 hepatic, 1 anterior branchial, 4 posterior branchial spines; anterior branchial slightly larger; posterolateral corner rounded, without distinct ridge. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines), horizontal, 0.5 × pcl; dorsal surface excavated, covered with fine setae; lateral margins with pair of subapical spines. Pterygostomian flap lateral surface granulate, with 2 rows of small spines in anterior portion, anterior margin narrow triangular and produced to strong spine.

Sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron 1.1 × as wide as long, sternites 5–7 laterally subparallel. Sternite 3 anterolaterally produced bluntly or acutely; median notch present without submedian spines; lateral margin with small spine at lateral corner; surface smooth. Sternite 4 2.3 × as wide as sternite 3, surface with short rows of setae, anteriorly shallow depressed in V-shape; anterolateral margin rounded with blunt anterior terminus but minutelyserrated, about as long as posterolateral margin; laterally unarmed.

Abdomen: Tergites covered with short, fine, scattered setae, unarmed, without ridges. Pleural margins of somites 2–4 rounded. Telson 2.2 × as broad as long; posterior margin emarginated; posterior portion 1.7 × length of anterior portion.

Eyes: Sparsely setose. Cornea subglobular, 0.5 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine. Article 3 unarmed. Article 4 with large distal spine, very long, reaching at least to midlength of article 5, longer than the article 4 itself; mesial margin unarmed. Article 5 armed with large distomedian spine; mesial margin with one small spine at midlength; 2.0 × as long as article 4. Antennal scale overreaching peduncle; 3.8 × as long as wide, laterally setose.

Maxilliped 3: Coxa unarmed. Basis smooth along mesial ridge. Ischium without distal spines; crista dentata with 18–22 denticles on. Merus extensor margin with long slender distal spine; flexor margin with two median spines and small granules. Carpus with strong distal spine and irregular extensor margin with setiferous ridges.

Cheliped: Stout; 3.9 × pcl; surface setose. Ischium with dorsal and very long and slender ventral spines distally. Merus covered with setiferous tubercles, with scattered spines along mesial surface and five distal spines. Carpus surface tuberculate; length 0.8–1.0 × that of palm. Palm 2.3–2.7 × as long as wide, setose. Dactylus 0.6 × as long as propodus; occlusal margins denticulate, with slight gape.

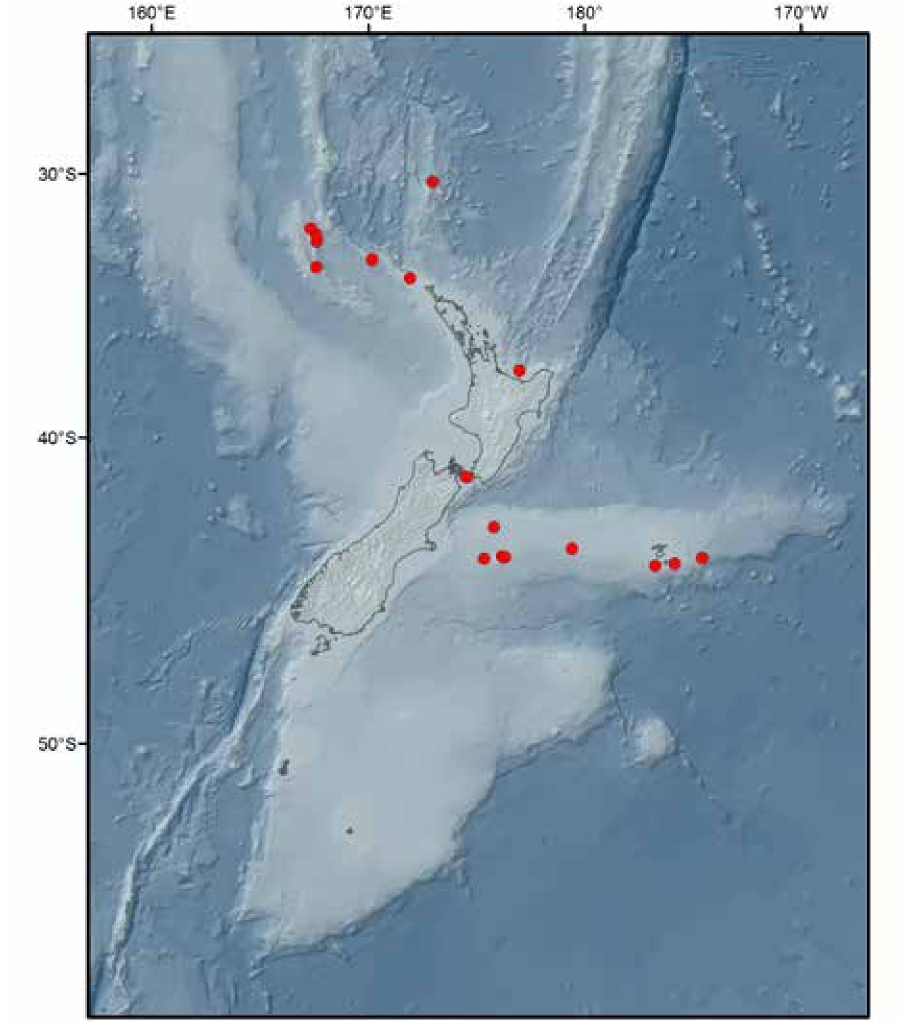
Pereopods 2–4: Similar; surface setose. Merus with 4–8 spines on dorsal crest (including distal spine); ventral margin with row of 4–7 distinct, proximally diminishing spines; 1.0–0.6 × as long as propodus, shortening from P2 to P4, P4 merus 0.6 × length of P2 merus. Carpus with double row of 2 or 3 spines along dorsal crest on P2, P3–4 at least with distinct granule proximally; P2–3 with distinct pair of distal spines. P4 propodus 4–5 × longer than wide; extensor margin with two proximal spines distinct at least on P2–3, indistinct on P4 and on P2–4 of smaller specimens; flexor margin straight, with 3 or 4 spines along distal 0.4 portion; 1.7 × as long as dactylus. Dactylus stout and nearly straight; slightly longer than carpus; flexor margin with 13–14 spines closely and obliquely arranged along entire length; ultimate spine distally sharp, slightly narrower than antepenultimate at base, penultimate spine nearly double width of antepenultimate, proximally preceded by relatively short but distally proportionately broad spines.

Ovum. Largest female (NMNZ CR.025253) with more than 80 eggs; diameter 1.0–1.3 mm.

Colour in life. A note included with small male (NIWA 88649) stated: "small yellow galatheid".

Etymology. Named after the vessel *Taranui*, which

Figure 172. Distribution of *Uroptychus taranui* **sp. nov.** around New Zealand.



was chartered by the New Zealand Oceanographic Institute (NZOI) between 1962 and 1971 and which collected the earliest samples of this species (NW Slope Benthos 1968, Phosphorite 1968, Chatham Benthos 1969, Chatham Profiler 1970). Used as a noun in apposition.

Remarks. The carapace length (pcl) of *U. taranui* **sp. nov.** ranges from 3.1 to 7.9 mm with ovigerous females from 3.8 mm, and the carapace is always a little wider than long. Notable variation includes the shape of the anterolateral terminus of thoracic sternite 4, which is rounded and slightly granular (as illustrated for holotype in Fig. 171, 52% of the specimens) or acute (36% of the specimens) but can differ on left and right on the same specimens. In one male (NMNZ CR.025251) it is expanded to a spatulate shape.

The chelipeds are stout and furnished with long setae, and proportions vary with size and sex. The cheliped-pcl length ratio of the female holotype is 3.8 (left) and 4.0 (right), slightly longer and more massive in both the largest male (NIWA 60526, 4.5 × pcl) and the largest female (NMNZ CR.025253, 4.2 × pcl), and much greater in the smallest specimens (NIWA 23362, 5.4 × pcl). The palm of the chelipeds is largest in the largest male (length-width ratio of 2.2), most slender in the smallest specimens (around 3.0) and intermediate in the female holotype (2.7).

The carpus of at least P2 always bears two distal spines, a strong spine on the dorsal crest and spine situated mesially. The distomesial spine is progressively diminished in size on P3 and P4, but typically obsolete on P4. The spines along the proximal extensor margin of P2–4 propodi are always distinct at least on P2 and may be reduced to granules on P3 or P4 in smaller specimens (e.g. absent in small NIWA 23362 and NIWA 23361 males). Dactylar spines range from 13 (female holotype) to 17 even on the smallest specimens (NIWA 23362).

The armature of the antennal peduncle varies only slightly, the article 5 has a small distomesial distinct in most specimens (70%), particularly in larger specimens, and obsolescent or absent in 30% of the specimens.

The large specimens of *U. taranui* **sp. nov.** appear increasingly rugose and spinose, e.g. the largest male (NIWA 60526) has a spinose cheliped with many setiferous ridges on the dorsal carpus surface; the carpus surfaces are typically not spinose in other specimens; the hepatic carapace region can bear a few additional spines (e.g. female NMNZ CR.025259) and the rostrum can bear serrations along the lateral margin, in addition to the pair of subapical spines (e.g. female NMNZ CR.015250). One male (NMNZ CR.025249) has a widened leaf-shaped rostrum instead of the narrowing triangular rostrum with subapical spines.

Uroptychus taranui **sp. nov.** aligns most closely with *U. chathami* **sp. nov.**, *U. taranaki* **sp. nov.**, and *U. tasmani* **sp. nov.** Their relationships are discussed under those species (also see Table 1 and Fig. 177, pages 262, 263). Of these species, *U. taranui* **sp. nov.** is most commonly found, with 18 localities around the northern New Zealand region.

Uroptychus cardus Ahyong & Poore, 2004 is also similar to *U. taranui* **sp. nov.** but it has a distinct row of epigastric spines (absent in *U. taranaui*), unarmed extensor margins of P2–4 meri, carpi and propodi (furnished with distinct spines in *U. taranaui*) and no subapical spines on the rostrum.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.9% (two specimens, NIWA 33655, 60526). Interspecific divergences all exceed 15%.

ZooBank registration. *Uroptychus taranui* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:17FD9C82-5C00-4581-A2B8-3C96C6E131A2.

Uroptychus taratara sp. nov. Figs 173, 174

Material examined. Holotype NMNZ CR.025260, NMNZ Stn K1/009/81, 34°40.8–41.5′S, 174°35.7–35.6′E, Northland Plateau, New Zealand, 910–940 m, 21 Nov 1981, male (16.7 mm, pcl 11.6 mm).

Other material. *Vanuatu*: NMNZ CR.0238071, NMNZ "Stn 3", 16°54.2′S, 168°15.8′E, 640 m, 6 Apr 1990, 1 female (12.6 mm, pcl 8.3 mm).

Type locality. Northland Plateau, 910–940 m.

Distribution. Northland Plateau (Fig. 174) and Vanuatu, 640–940 m.

Habitat. Unknown.

Diagnosis. Carapace lateral margin with distinct spines, other than anterolateral spine; dorsal surface densely covered with spines and short spiny ridges, distinct row of 5 epigastric spines. Rostrum narrow triangular, with series of lateral spines. Abdominal somites unarmed but distinct transverse ridge on somite 1. Excavated anterior margin of thoracic sternite 3 with median notch separating small submedian spines. Antennal scale not reaching end of peduncle. Cheliped spinose, palm with rows of spines continued from merus and carpus. P2–4 meri and carpi spinous; propodi margins nearly parallel; dactyli tapering distally, with 11 or 12 sharp triangular spines, loosely arranged along entire length and nearly perpendicular to flexor margin; ultimate spine (sub)equal in size to penultimate.

Description. Carapace: As long as broad (pcl), shallow convex from side to side. Dorsal surface strongly spinose; gastric region with five distinct epigastric spines and a multitude of small spines and granules throughout region; the remaining dorsal surface covered with small spines; cervical groove not deep but distinct. Lateral orbital spine small. Anterolateral spine well-developed, overreaching lateral orbital spine; lateral carapace margins convexly divergent posteriorly; with 7–9 spines excluding anterolateral spine: 2 or 3 hepatic, 1 anterior branchial spine followed by a few smaller spines, 4 large posterior branchial spines; anterior branchial largest. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines), horizontal, about 0.5 × pcl; dorsal surface excavated; lateral margins with 5 or 6 small spines. Pterygostomian flap surface granulate in anterior portion; anterior margin produced into spine.

Thoracic sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron 1.2 × as wide as long, sternites 5–7 slightly widening posteriorly. Sternite 3 anterolaterally produced to sharp spine; with median notch and submedian spines; lateral margin with distinct spine at corner. Sternite 4 2.4 × as wide as sternite 3, surface with small spines and granules, anteriorly with V-shaped depression, midline grooved; anterolateral margin with a number of acute spines, nearly reaching anterior margin of sternite 3, longer than posterolateral margin. Sternite 5 and 6 anterolateral margins strongly lobed and serrated.

Abdomen: Tergites smooth and unarmed. Tergite 1 with sharp transverse ridge; tergites 2–3 with less distinct transverse ridges anteriorly. Pleural margins of somites 2–4 strongly tapering distally. Telson nearly 2 × as broad as long; posterior margin emarginated; posterior portion 1.4 × length of anterior portion.

Eyes: Smooth. Cornea subglobular, 0.4 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct outer spine. Article 3 unarmed. Articles 4 and 5 with distal spines; mesial margins unarmed; article 5 1.7 × as long as article 4. Antennal scale nearly reaching end of article 5, with serration along lateral edge; just over 4 × as long as wide.

Maxilliped 3: Coxa unarmed mesially. Basis with 1 distal denticle along mesial ridge. Ischium without distal spines; crista dentata with 24 denticles. Merus extensor margin with distal spine; flexor margin with row of spines distally and proximal granules. Carpus

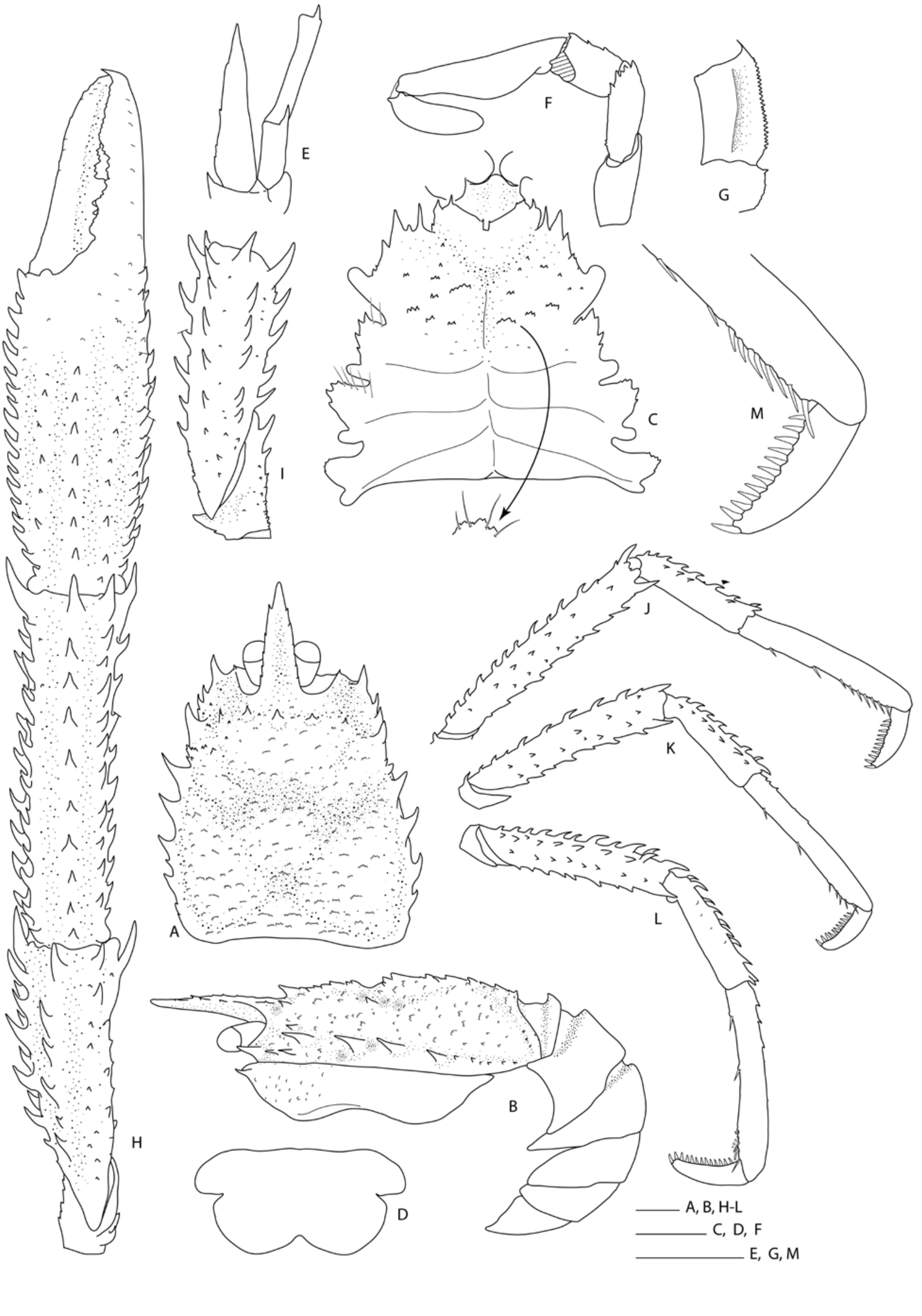
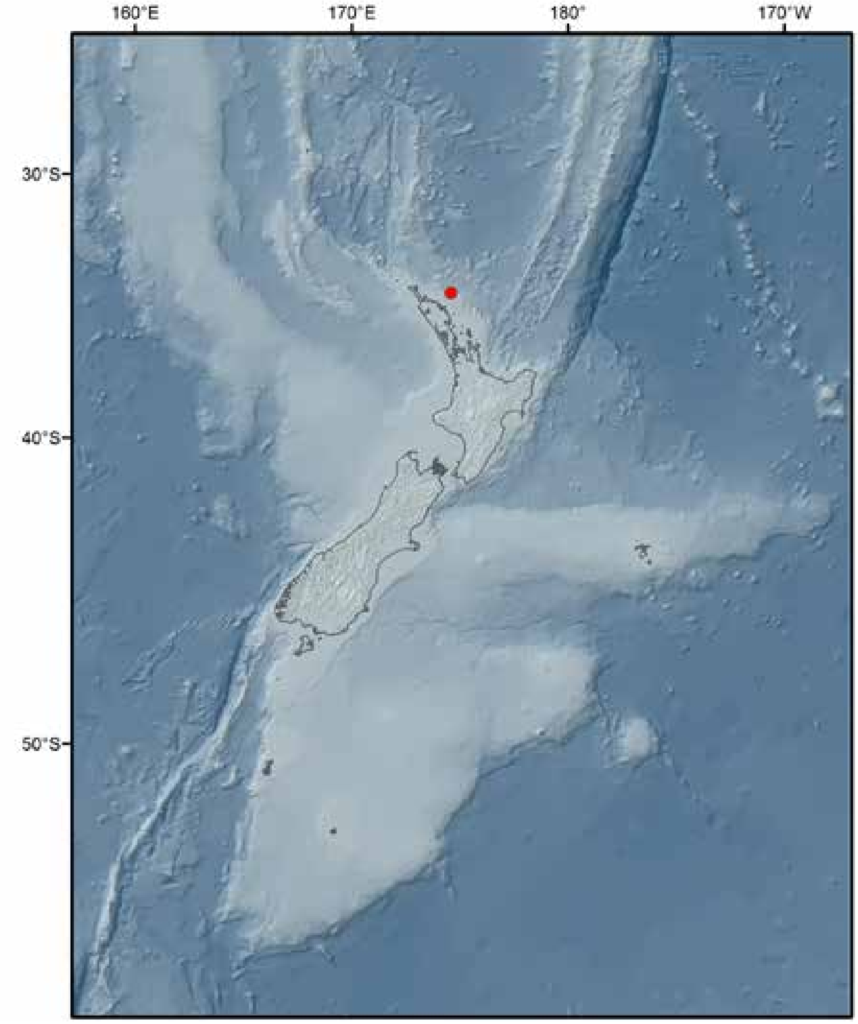


Figure 173. *Uroptychus taratara* **sp. nov.**, holotype male, pcl 11.6 mm, NMNZ CR.025260: **A.** carapace, dorsal; **B.** carapace and abdomen, lateral; **C.** sternal plastron with enlarged detail of granular ridge on sternite 4; **D.** telson; **E.** antenna, right, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata, right; **H.** right cheliped, dorsal; **I.** left cheliped, ischium and merus, mesial; **J–L.** right P2–4; **M.** P2 distal propodus and dactylus. Scale bars = 2 mm.

Figure 174. Distribution of *Uroptychus taratara* **sp. nov.** around New Zealand.



with small distal spine and 3 or 4 teeth on extensor margin.

Cheliped: Elongate; 4.7 × pcl; surface strongly spinose, with distinct rows of spines. Ischium with distodorsal and distoventral spines, with row of spinules on ventralmesial margin and scattered granules on surface. Merus surface with 5 rows of spines, laterally large and mesially smaller; with 4 distal spines. Carpus surface with 7 longitudinal rows of spines; with 5 distal spines or blunt processes; length 1.1–1.2 × that of palm. Palm 2.3–2.2 × as long as wide, with distinct rows of spines. Dactylus 0.7–0.8 × as long as propodus; occlusal margins denticulate, with slight gape.

Pereopods 2–4: Similar; surface spinose. Merus with 10–14 spines on dorsal crest (including large distal spine); ventral margin with 8–10 short spines; lateral surface with 2 rows of spines or granules. Shortest merus on P4, about 0.8 × P2 merus. Carpus with double row of spines: 8 spines on dorsal crest (including distal), another row of 4–7 dorsolateral spines or granules; ventrally unarmed. Propodus 7.0 (P2) –7.8 (P4) × longer than wide; extensor margin proximally crenulate; flexor margin straight, with 5–8 spines, 2 spines widely spaced in proximal half, the remaining clustered along distal third to half, and distal pair of spines; 2.9–2.6 × as long as dactylus (P2–P4). Dactylus nearly straight; flexor margin with 11 or 12 sharp triangular spines loosely arranged along entire length, nearly perpendicular to flexor margin; ultimate spine subequal in size to penultimate.

Colour in life. Not known.

Etymology. Named *taratara*, the Māori term for 'barbed' or 'prickly', referring to the spiny appearance of this species.

Remarks. The two specimens of *U. taratara* **sp. nov.** are from two widely separated locations; nevertheless, the female collected from Vanuatu matches the holotype from New Zealand well. It is slightly larger than the holotype, with the one remaining right cheliped the same size (3.2 × cl), the palm slightly narrower (2.0 × as long as wide, compared to 2.3 (right) and 2.2 (left) ×) and the spination slightly less pronounced; the anterolateral corner of sternite 3 is less acute.

Uroptychus taratara **sp. nov.** is clearly aligned with *U. spinimanus* Tirmizi, 1964 from the South Arabian Sea in the overall shape and spination of the carapace and abdomen. Illustrations of the type material of *U. spinimanus* deposited at the Natural History Museum in London were kindly made available by Keiji Baba and are used for comparison in addition to the original figures provided by Tirmizi (1964). The carapace spination appears to be more distinct in *U. spinimanus*, with the spines covering the carapace subequal in size to the epigastric spines while in *U. taratara* **sp. nov.** the carapace is covered with small spinulose ridges and granules which are less pronounced than the distinct row of epigastric spines (Fig. 173). Additionally, the Mxp3 merus bears a distinct distomesial spine at least in the large male (cl 13.8 mm) and female (cl 13.1 mm), which is absent in *U. taratara* **sp. nov.**; the antennal scale distinctly overreaches the peduncle in *U. spinimanus* and only barely reaches the end of the peduncle in *U. taratara* **sp. nov.**, the P2–4 propodi appear to be distally more inflated in *U. spinimanus* compared to in *U. taratara* **sp. nov.** where the spinose portion is nearly straight on all legs. Finally, the ultimate spine of the P2–4 dactyli is distinctly smaller than the penultimate spine in *U. spinimanus* and it is subequal in size in *U. taratara* **sp. nov.**

In New Zealand, *U. taratara* **sp. nov.** aligns most closely with other spinose species with an unarmed abdomen, *U. taniwha* **sp. nov.**, *U. paku* Schnabel, 2009, and *U. tracey* Ahyong, Schnabel & Baba, 2015, but *U. taratara* **sp. nov.** differs from all of these in having a clearly spinose cheliped palm (unarmed in the others); the two distal spines of the P2–4 dactyli are subequal, as in *U. taniwha* **sp. nov.**, but the penultimate spine is distinctly pronounced, about 2 × wider than the ultimate in *U. paku* and *U. tracey*. *Uroptychus taratara* **sp. nov.** can also be easily distinguished from *U. taniwha* **sp. nov.** by the P2–4 meri and carpi being spinose and the spination along the propodal flexor margin, all unarmed in *U. taniwha* **sp. nov.** except for the distal pair on the propodi.

ZooBank registration. *Uroptychus taratara* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:12DB70BE-1F2F-4E27-905D-787817C2115C.

Uroptychus tasmani sp. nov.

Figs 175, 176, 177 E, N, O

Material examined. Holotype NMNZ CR.025261, NMNZ Stn BS314, eastern edge of Challenger Plateau, on shallow continental shelf due west of Mount Taranaki, 39°22.00′S, 171°49.99′E, 230–251 m, 25 Oct 1960, female (7.4 mm, pcl 4.8 mm).

Type locality. Eastern edge of Challenger Plateau, due west of Mount Taranaki, 230–251 m.

Distribution. Known only from the type locality (Fig. 176).

Habitat. Unknown.

Diagnosis. Carapace lateral margin with 2 or 3 small hepatic and six distinct branchial spines on either side, other than anterolateral spine; lateral orbital spine distinct, slightly smaller than and nearly reaching anterolateral spine; scattered hepatic spines on dorsal surface. Rostrum narrow triangular; subapical spines distinct, followed by small irregular lateral spines posteriorly. Pterygostomian flap with rounded anterior margin bearing small spine. Thoracic sternite 3 anterolateral angle acute, laterally with 2 spines; anterior margin with pair of submedian spines flanking U-shaped median notch; sternite 4 posterolateral margin shorter than anterolateral margin. Cheliped merus and carpus with scattered small spines; row of strong mesial spines on merus. P2–4 meri with row of small spines along extensor margin; carpi with distal spine on P2, otherwise unarmed; propodi margins subparallel, extensor margin smooth, with pair of terminal spines only; dactyli tapering distally, around twice as long as carpi, P4 dactylus subequal in length to P4 merus; flexor margin with regular row of 11–14 sharp, inclined spines gradually increasing in size toward apex; penultimate spine prominent, about twice size of both ultimate and antepenultimate spines.

Description. Carapace: pcl 0.85 × width. Dorsal surface with a few scattered spines in hepatic and lateral gastric region, otherwise unarmed; cervical groove not deep but distinct. Lateral orbital spine sharp, slightly smaller than to subequal to well-developed anterolateral spine. Lateral margins slightly convexly divergent posteriorly, with 9 spines excluding anterolateral spine: 3 hepatic spines or granules, 1 anterior branchial; 5 posterior branchial spines, progressively smaller proximally; anterior branchial spine largest. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines), slightly deflected ventrally, 0.7 × pcl; dorsal surface excavated; lateral margin with subapical spines followed by 3 or 4 additional spines or granules. Pterygostomian flap surface with 2 longitudinal rows of small spines on anterior portion; anterior margin soundish, produced into small spine.

Thoracic sternum: Excavated sternum with convex anterior margin and low ridge on midline. Sternal plastron as wide as long, sternites 5–7 laterally subparallel; surface smooth. Sternite 3 anterolaterally acute, ending in small spine flanked by lateral spine, with small spine at lateral corner; anterior margin with median notch and submedian spines. Sternite 4 nearly 2 × as wide as sternite 3, anteriorly broadly concave; anterolateral margin produced to tooth (not overreaching sternite 3), longer than posterolateral margin; laterally unarmed. Sternite 5 anterolateral margin anteriorly triangular (not rounded).

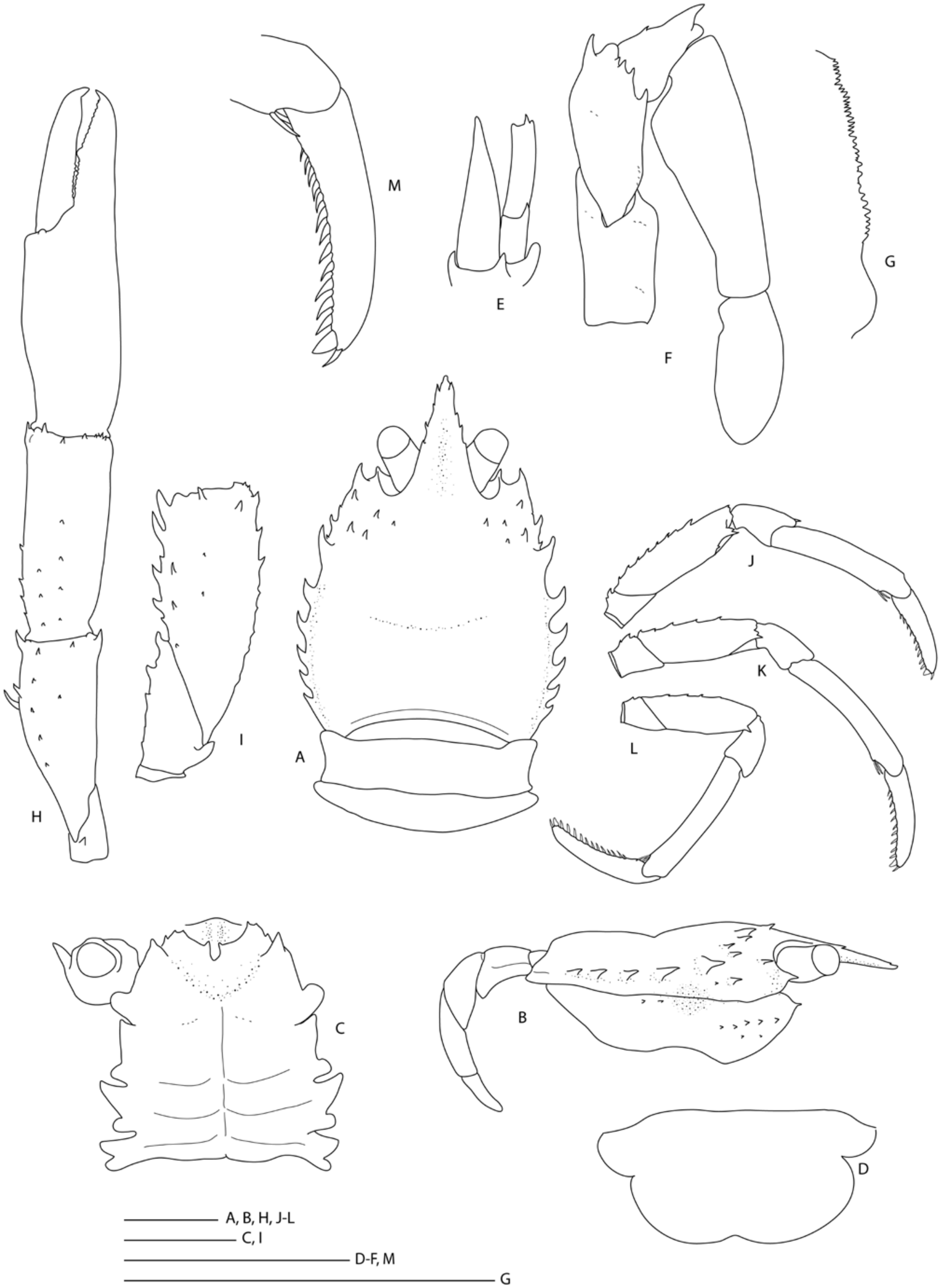
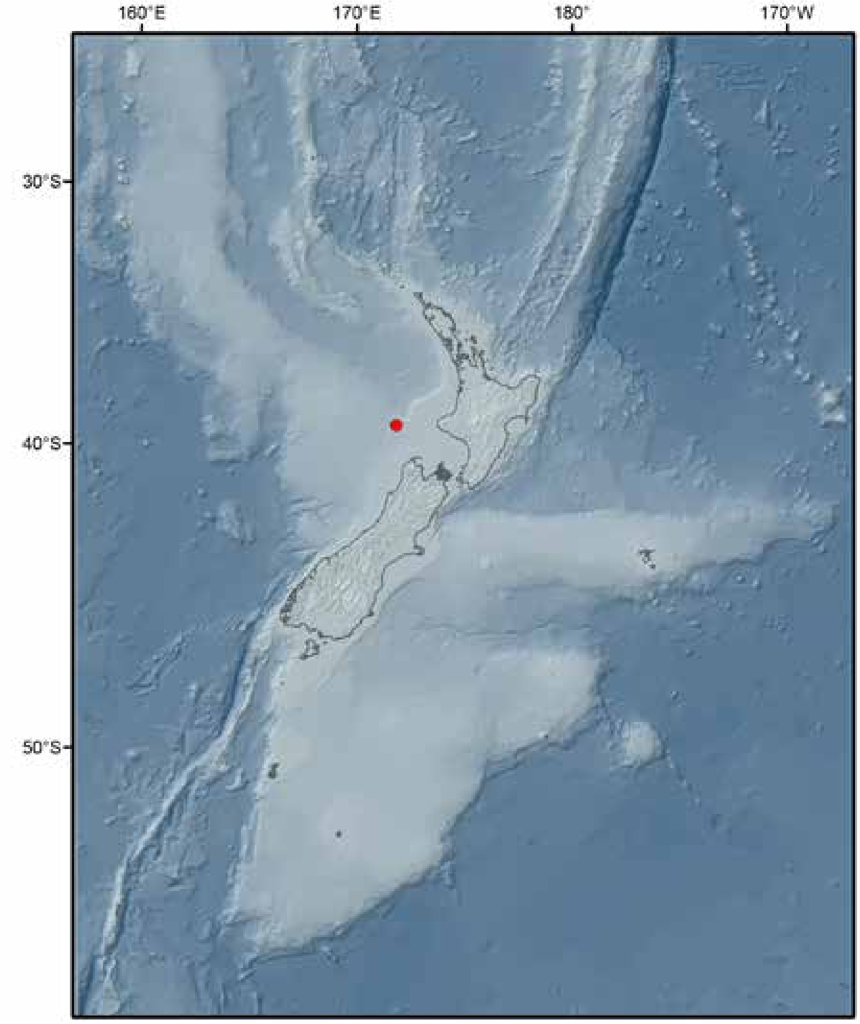


Figure 175. *Uroptychus tasmani* **sp. nov.**, holotype female, NMNZ CR.025261: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum, sternal plastron and right coxa of cheliped, ventral; **D.** telson; **E.** antenna, right, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata, right; **H.** right cheliped, dorsal; **I.** right cheliped, ischium and merus, mesial; **J–L.** right P2–4; **M.** P4 distal propodus and dactylus. Scale bars = 2 mm.

Figure 176. Distribution of *Uroptychus tasmani* **sp. nov.** around New Zealand.



Abdomen: Tergites smooth, unarmed. Telson 0.5 × as broad as long; posterior margin emarginated; posterior portion 1.1 × length of anterior portion.

Eyes: Smooth. Cornea subglobular, 0.4 × length of ocular peduncle.

Antennal peduncle: Article 2 with distinct lateral spines. Article 3 unarmed. Article 4 with large distal spine; mesial margin unarmed. Article 5 armed with small distomedian spine; mesial margin unarmed; 2.1 × as long as article 4. Antennal scale reaching end of or slightly overreaching end of peduncle; 2.7 × as long as wide.

Maxilliped 3: Coxa unarmed. Basis smooth along mesial ridge. Ischium unarmed other than crista dentata with 33 denticles. Merus extensor margin with large distal spine; flexor margin with 4 spines on distal third. Carpus with large distal and small proximal spine at midlength of extensor margin.

Cheliped: Stout; 3.5 × pcl; surface with a few scattered small spines. Ischium with dorsodistal and distoventral spines and row of spines along ventromesial margin. Merus surface with rows of granules, row of strong mesial spines; with 7 distal spines. Carpus surface spinose with scattered small spines along proximal portion; with 7 distal spines; as long as palm. Palm 2.0 × as long as wide, unarmed and smooth. Dactylus about 0.8 × as long as propodus; occlusal margins denticulate, without gape.

Pereopods 2–4: Similar; surface slightly setose. Merus 0.9–0.7 × as long as propodus, successively shortening posteriorly, P4 0.8 × P2; dorsal margin with 4–8 spines, minute distal spine on P2 only, P3–4 rounded distally; ventral margin with distal spine, bifurcated on P2–3. Carpus dorsal margin with distal spine on P2 only, unarmed on P3 and P4. Propodus 4.2–4.8 × longer than wide (P2–4); extensor margin smooth; flexor margin straight, with pair of distal spines only; 1.6–1.4 × as long as dactylus (P2–4). Dactylus nearly straight; around twice as long as carpus; P4 dactylus longest, equally long as merus, P2–3 dactyli shorter than merus; flexor margin with 11–14 spines loosely and regularly arranged along entire length; ultimate slightly narrower than antepenultimate; penultimate spine prominent, twice as broad as antepenultimate, spines proximal to penultimate spine subequal and proximally diminishing.

Colour in life. Not known.

Etymology. Named after the Dutch explorer Abel

Table 1. Comparison of select diagnostic characters for *Uroptychus cardus* Ahyong & Poore, 2004, *U. chathami* **sp. nov.**, *U. taranaki* **sp. nov.**, *U. taranui* **sp. nov.** and *U. tasmani* **sp. nov.**

	Uroptychus cardus (pcl 3.9–14.4 mm)	***Uroptychus chathami*** (pcl 2.9–7.5 mm)	***Uroptychus taranaki*** (pcl 7.3–8.5 mm)	***Uroptychus taranui*** (pcl 3.0–7.8 mm)	***Uroptychus tasmani*** (pcl 4.8 mm)
Epigastric spines	>10 spines across region	A few lateral granules	1–2 lateral granules	1–2 lateral granules	3–4 small lateral spines
Hepatic spines	2	2–3 tubercles	3–4	2	2–3
Lateral branchial spines	5	2, followed by serrations	4	5	6
Rostrum lateral spines	Absent	Subapical spines (may be followed by indistinct serrations)	Subapical spines	Subapical spines (may be followed by indistinct serrations)	Subapical spines followed by distinct serrations
Cheliped carpus dorsal surface	Covered with setose scales and small spines	With distinct rows of spines	With setose scales	With setose scales	With a few small proximal spines
P2–4 meri dorsal margin	With serrations or low spines	With serration or small spines	Unarmed	With distinct spines	With small spines
P2–4 carpi dorsal margin	With proximal granules (may have small distal spine)	With 2 rows of spines	With 1 distal spine	With 2 rows of spines	With at most 1 distal spine (on P2)
P2–4 propodi with extensor marginal spines	No	Yes (entire margin)	No	Yes (2 proximal)	No
P2–4 propodi with flexor spines other than distal	Yes (2–7)	Yes (2–4)	Yes (3–4)	Yes (3–4)	No
P4 dactylus/carpus length ratio	1.2–1.4	~1.3	~1.5	1.2–1.4	2.0
Shape and arrangement of P2–4 dactylar spines	Sharp triangular, loosely arranged	Very sharp and slender, loosely arranged	Rounded, contiguous	Rounded, contiguous	Sharp triangular, loosely arranged

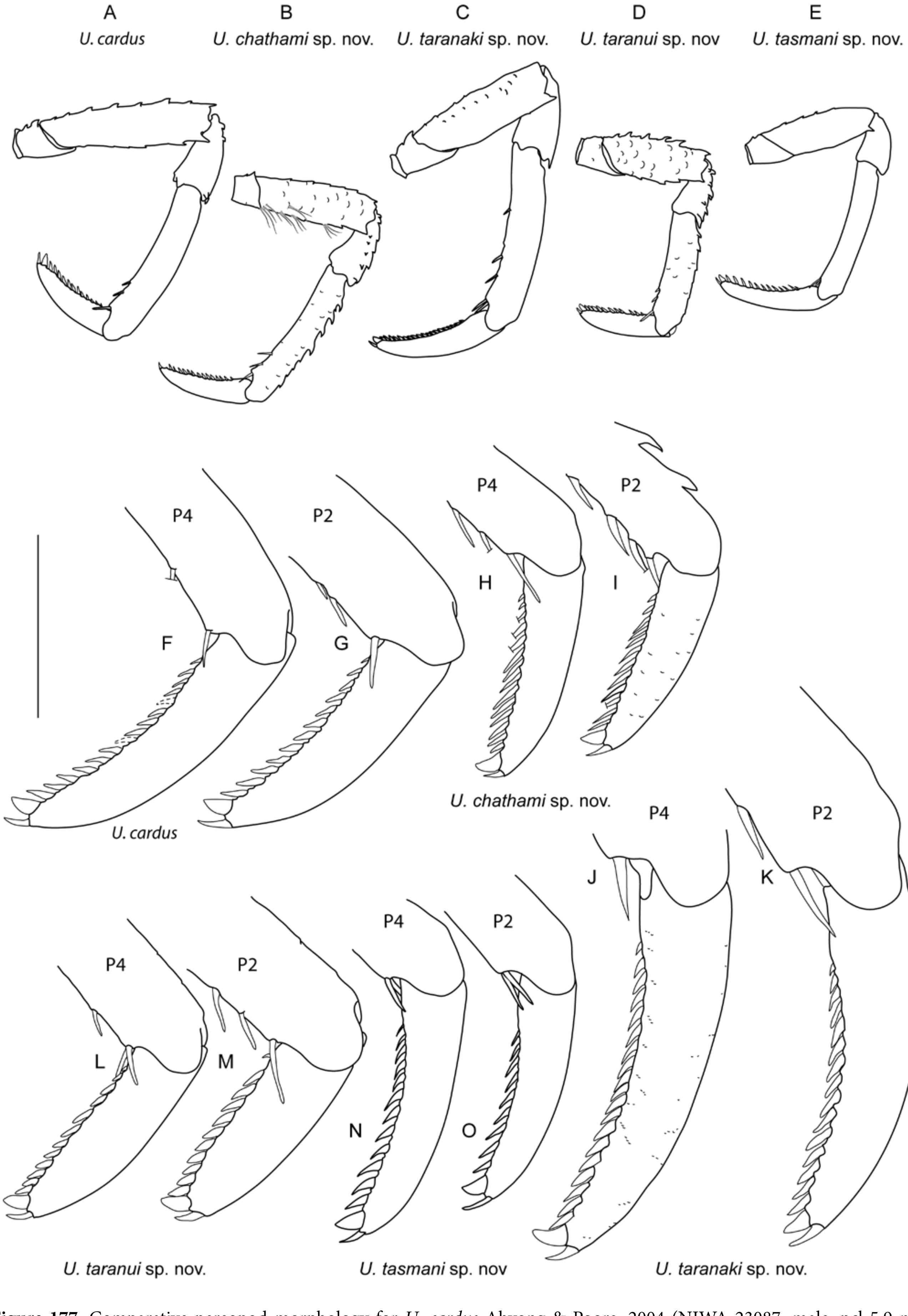


Figure 177. Comparative pereopod morphology for *U. cardus* Ahyong & Poore, 2004 (NIWA 23087, male, pcl 5.9 mm, A, F, G), *U. chathami* **sp. nov.** (holotype female ov., NIWA 61863, pcl 5.6 mm, B, H, I), *U. taranaki* **sp. nov.** (holotype female, NMNZ CR.025248, pcl 8.5 mm, C, J, K), *U. taranui* **sp. nov.** (paratype female ov., NMNZ CR.025254, pcl 5.6 mm, D, L, M) and *U. tasmani* **sp. nov.** (holotype female, NMNZ CR.025261, pcl 4.8 mm, E, N, O). A–E, pereopod 4, lateral, not to scale; F, H, J, L, N, dactylus and distal portion of propodus of P4; G, I, K, M, O, dactylus and distal portion of propodus of P2. Scale = 2 mm (F–O).

Janszoon Tasman, reportedly the first European to visit New Zealand, in 1603. The Tasman Sea, the only known location for this new species, is named after him.

Remarks. The single specimen of *U. tasmani* **sp. nov.** had been previously dissected, and the left antenna is missing. All appendages are detached and the left P4 is missing. The specimen is poorly preserved, very soft and transparent, but sufficiently intact to be described as a new species here (Fig. 175).

Uroptychus tasmani **sp. nov.** appears close to the group of species that have a stout carapace (width exceeds length), with distinct lateral spines, subapical spines on the rostrum, distinct spine each on antennal articles 4 and 5 and on Mxp3 merus and carpus, and robust P1–4 which have at least some setiferous ridges and spines. This includes *U. chathami* **sp. nov.**, *U. taranaki* **sp. nov.**, and *U. taranui* **sp. nov.**; a comparison of morphological characters that can be used to distinguish between these species is included in Table 1 and Fig. 177. The table and figure also include *U. cardus* Ahyong & Poore, 2004, since this species also shares most of the characteristics listed above; however, it always lacks the subapical spines on the rostrum. Species are differentiated based on the number of lateral and dorsal spines of the carapace, the armature, and the proportion and shape of the P2–4 dactyli.

Uroptychus tasmani **sp. nov.** is distinct from all the other species in the number of branchial spines along the lateral carapace (six in *U. tasmani* **sp. nov.** and less in all others), the P2–4 propodi only with a distal pair of spines (with additional proximal spines in all others) and the P4 dactylus proportionately long, about twice as long as the carpus (only slightly to 1.5 × longer than the carpus in the other species).

Uroptychus tasmani **sp. nov.** is aligned with *U. belli* **sp. nov.** in the key to New Zealand species *Uroptychus* primarily based on the shared characteristics of the walking legs. These are the propodi with only a distal pair of spines, carpi with at most one distal spine, dactyli with prominent penultimate spine, and the distinctly longer P4 dactylus compared to the P2 dactylus. The most distinctive difference between these two species is the armature of the carapace and the P2–4 meri, with *U. tasmani* **sp. nov.** bearing six lateral branchial spines and low spines along the extensor of the meri, while *U. belli* **sp. nov.** has a number of serrations or small spines along the lateral carapace margin and smooth meri.

ZooBank registration. *Uroptychus tasmani* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:0D6F9642-340E-469D-9617-2C8BDE835D7E.

Uroptychus terminalis Baba, 2018

Figs 127, 178–180

Diptychus australis Henderson, 1885: 420 (part).
Uroptychus australis Henderson, 1888: 179 (part), pl. 21: figs 4, 4a–4c (specimens from Kermadec Islands); Thomson 1899: 197 (list). [Not *U. australis* (Henderson, 1888)]
Uroptychus sp., Schnabel 2009a: 578 (part); Schnabel 2009b: 27 (list).
Uroptychus terminalis Baba, 2018: 513, figs 258–260.

Material examined. *Norfolk Ridge*: NHMUK 1888:33 (paralectotype *of U. australis*), H.M.S. *Challenger* Stn 171, 28°33.00′S, 177°50.00′W, 1098 m, 15 Jul 1874, 1 female ov. (8.3 mm, pcl 7.3 mm); NHMUK 1888:33 (paralectotype *of U. australis*), H.M.S. *Challenger* Stn 170, 29°55′S, 178°14′W, 952 m, 14 Jul 1874, 1 female ov. (8.5 mm, pcl 5.8 mm).

Kermadec Islands, *Raoul Island*: NIWA 29734, NIWA Stn TAN0706/32, 30°05.89′S 178°30.98′W, 1201–1262 m, 16 May 2007, 1 male (9.5 mm, pcl 6.7 mm); Part of NMNZ CR.012099 reported in Schnabel (2009a), Stn BS312, 28°25′S, 177°50′E, 1189–1225 m, 5 Apr 1973: CR.012099, 1 male (9.5 mm, pcl 6.6 mm); CR.023691, 1 female ov. (9.9 mm, pcl 7.1 mm); CR.023692, 1 female (8.6 mm, pcl 6.0 mm); CR.023694, 1 female (10.0 mm, pcl 6.9 mm); CR.023698, 1 male (8.8 mm, pcl 6.0 mm); CR.023699, 1 female ov. (9.1 mm, pcl 6.3 mm); CR.023701, 1 male (7.6 mm, pcl 5.2 mm); CR.023703, 1 female (7.0 mm, pcl 5.0 mm); CR.023762, 1 female (6.6 mm, pcl 4.5 mm), 2 males (10.5, 5.4 mm, pcl 6.9, 3.5 mm). Preserved with fragments of gold coral.

Kermadec Islands, *Macauley Island*: AKM MA124691 (ex NIWA 118628), Kermadec-Rangitahua Stn TAN1612/71, 30°17.01–17.41′S, 178°11.82–12.03′W, 1431–1426 m, 29 Oct 2016, 1 female (9.7 mm, pcl 7.2 mm; sequenced, see Fig. 5).

Southern Kermadec Ridge, *Clark Seamount*: NIWA 72275, NIWA Stn TAN1104/20, 36°29.04–28.93′S, 177°53.24–53.10′E, 1328–1272 m, 3 Mar 2011, 1 male (6.5 mm, pcl 4.3 mm; sequenced, see Fig. 5), on *Chrysogorgia geniculata*.

Bay of Plenty: NIWA 82539, NIWA Stn TAN1206/68, 37°21.91–21.84′S, 177°52.73–52.44′E, Eastern Bay of Plenty, 1229–1250 m, 21 Apr 2012, 1 male (10.1 mm, pcl 7.1 mm; sequenced, see Fig. 5), on *Chrysogorgia* sp.

Type & locality. Holotype—MNHN-IU-2014-16975, BIOCAL Stn CP30, 23°09′S, 166°41′E, Norfolk Ridge, 1140 m, 29 Aug 1985, male (pcl 8.4 mm).

Distribution. Solomon Islands, Vanuatu, Loyalty Basin, Norfolk Ridge, and Kermadec Islands, 372–1260

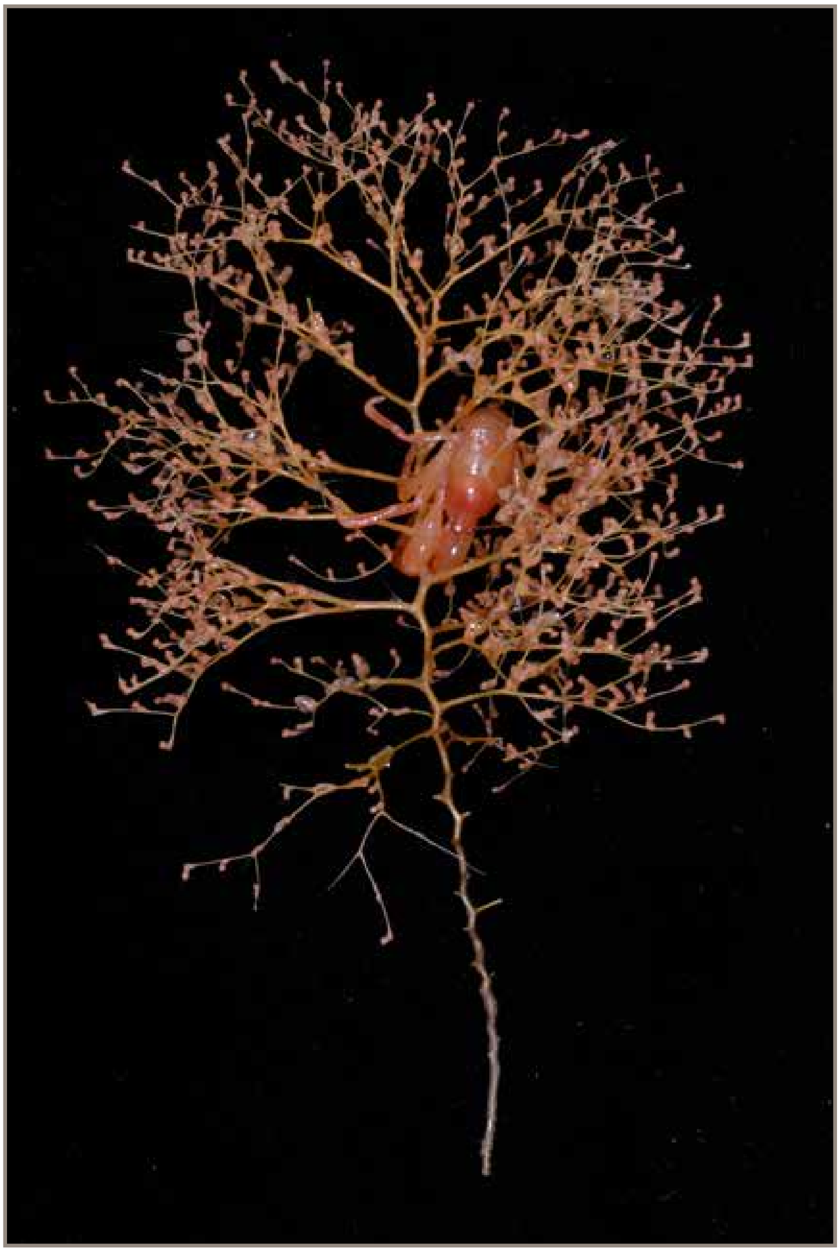


Figure 178. Live coloration of *Uroptychus terminalis* Baba, 2018, collected with a colony of *Chrysogorgia*, NIWA 82539, Stn TAN1206/68. Image courtesy of Owen Anderson, NIWA.

m (Baba 2018); Southern Kermadec Ridge and Bay of Plenty, 1189–1426 m (Fig. 180).

Habitat. Three sets of the specimens of *U. terminalis* were collected with or from within a gold coral colony (Fig. 178); an association is thus likely.

Diagnosis. Carapace (pcl) 1.1 × width; dorsally smooth except small to large pair of epigastric spines; lateral margin unarmed, usually with a few tubercles. Rostrum narrow (width < 0.5 × distance between anterolateral spines at base). Ocular peduncle about 1.5 × longer than wide. Sternite 3 deeply excavated anteriorly, with distinct median notch and submedian spines. Cheliped ischium with small subterminal spine or granule ventrally. P2–4 relatively broad, P2 merus 3.7–4.8 × longer than broad; 0.9–1.1 × length of P3 merus. Propodi with row of spines along distal half of flexor margin, terminal spine single and situated close to juncture with dactylus; dactyli distally narrowed (not truncate); flexor marginal spines sharp triangular, obliquely directed, arranged loosely and regularly with exception of antepenultimate spine nearly placed slightly remotely from both penultimate and proximal group of spines; ultimate slightly larger than penultimate and subequal to antepenultimate in size.

Colour in life. Orange base colour with darker red coloration in anterior carapace portion and distal half of walking legs (Fig. 178).

Remarks. Baba (2018) referred the two female syntypes of *U. australis* (Henderson, 1885) from HMC *Challenger* stations 170 and 171, off the Kermadec Islands to *U. terminalis* and designated a large male collected from Norfolk Ridge as the holotype (pcl 8.4 mm). Other material was also reported from across the southwest Pacific region (Solomon Islands, Vanuatu, Loyalty Basin, and Norfolk Ridge, 372–1260 m).

Schnabel (2009a) reported *U. terminalis* as *Uroptychus* sp. since its description was under way at the time. However, the specimen series reported

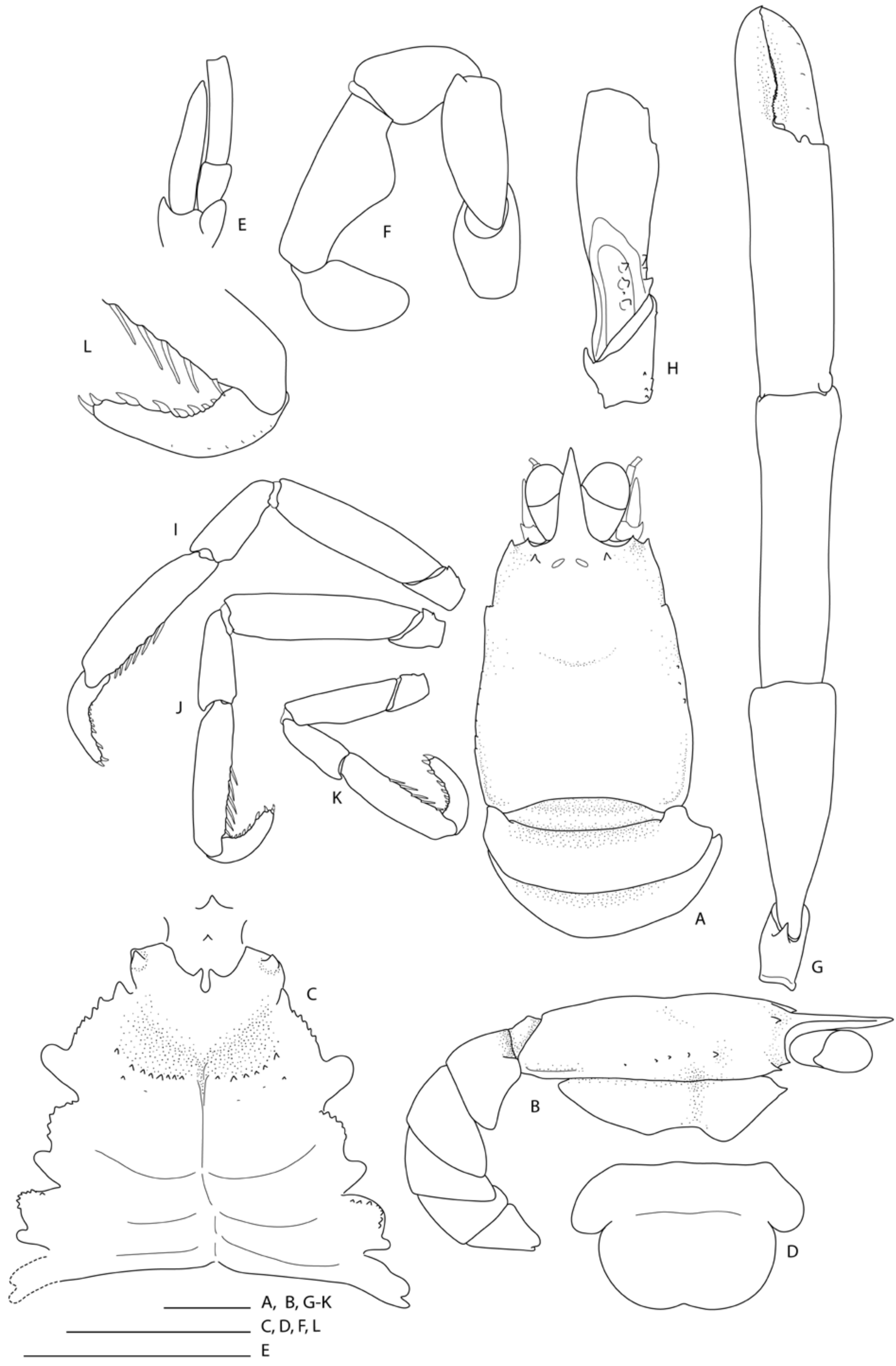
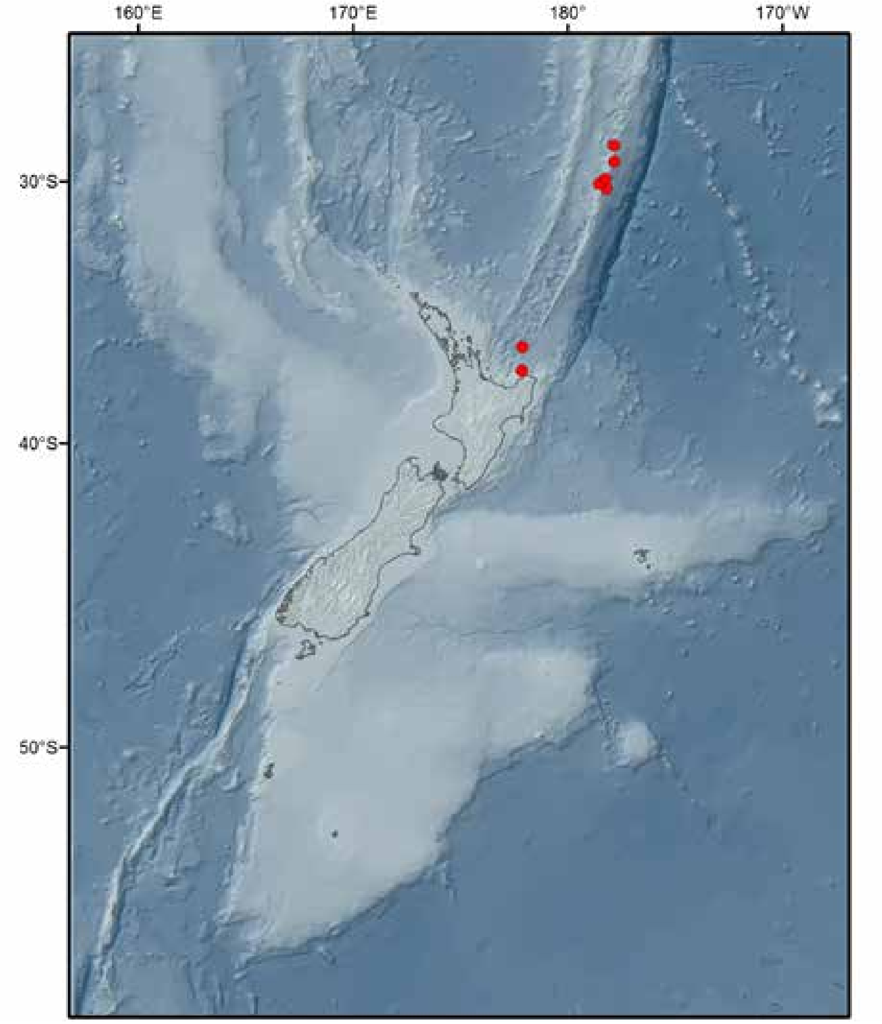


Figure 179. *Uroptychus terminalis* Baba, 2018, female ov., NHMUK 1888:33: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron, ventral; **D.** telson; **E.** antenna, right, ventral; **F.** endopod of Mxp3, left, lateral; **G.** left cheliped, dorsal; **H.** left cheliped, ischium and merus, mesial; **I–K.** left P2–4; **L.** distal propodus and dactylus of P2 or P3. Scale bars = 2 mm.

Figure 180. Distribution of *Uroptychus terminalis* Baba, 2018 around New Zealand.



represents a mix of two species, *U. terminalis* and *U. nigricapillis* Alcock, 1901, and these two species can occur sympatrically and have been picked off the same host coral (of the 22 specimens reported as NMNZ CR.012099 half belong to *U. terminalis* and *U. nigricapillis* each).

The material of *U. terminalis* examined here falls within the range reported by Baba (2018), males measured 5.2–7.1 mm (pcl) and females 5.0–8.5 mm. The length of the cheliped for the males examined here ranged from 4.4 to 4.5 × pcl and for females from 3.8 to 4.5 × pcl. The cheliped palm is always more massive for males compared to females of the same size. The cheliped ischium nearly always bears a small but distinct ventromesial subterminal spine (but can be absent, as in specimen illustrated in Fig. 179) and the double row of tubercles along the proximal portion of the merus is usually distinct. Also, the ocular peduncle typically has a concave mesial margin, although this may be indistinct.

Uroptychus terminalis is morphologically close to *U. nigricapillis* and the distinctions between the two are discussed under the latter species above. The species is also close to *U. australis* (Henderson, 1885), and *U. empheres* Ahyong & Poore, 2004; *U. terminalis* differs from both congeners in having the terminal spine(s) on the P2–4 propodal flexor margin paired in both *U. australis* and *U. empheres* and single in *U. terminalis*; and having paired epigastric spines always distinct in *U. terminalis* (versus small granules or absent). *Uroptychus australis* notably differs in the direction of the P2–4 dactylar spines which are oriented parallel to the margin, inclined in both *U. terminalis* and *U. empheres*. Also see the remarks under both species above. As mentioned before, these differences are slight, and it is notable that all these species can be collected together at the same station. DNA sequence data supports each of these species as distinct, with data for the CO1 gene showing that at least *U. terminalis* and *U. empheres* are more similar to each other than other species and divergences are similar compared to a range of other species (see below). Since these occur sympatrically and can be found on the same host, questions arise as to the diversification of this group. A focused phylogenetic study of this group of species using additional genetic markers could provide useful insights into the pattern and timing of divergences and possibly radiation in the southwestern Pacific region.

One male and a female (NMNZ CR.023762) carry a sacculinid externa under the abdomen and a bopyrid under the carapace, respectively.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.9–1.9% (three specimens, NIWA 72275, 82539, 118628). Closest interspecific divergences: 8.3–8.9% (*U. empheres*).

Uroptychus thermalis Baba & de Saint Laurent, 1992 Figs 181–183

Uroptychus thermalis Baba & de Saint Laurent, 1992: 324, fig. 2; Chevaldonné & Olu 1996: 293 (no record); Ahyong & Poore 2004: 77, fig. 24; Baba 2005: 231 (synonymies, key); Macpherson & Baba 2006: 454, figs (no record); Baba *et al.* 2008: 44 (list and synonymies); Schnabel 2009b: 31 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 210 (list); Baba 2018: 518, figs 261–263.

Type & locality (not examined). Holotype— MNHN-IU-2014-12823 (MNHN Ga-2351), 16°59.50´ S, 173°55.47´ W, North Fiji Basin, hydrothermal vent, 2000 m, male (pcl 8.4 mm).

Material examined. *Kermadec Islands*, *Macauley Island*: AKM MA124692 (ex NIWA 118823), Kermadec-Rangitahua Stn TAN1612/81, 30°17.53–17.71′S, 178°08.09–08.35′W, 1826–1823 m, 29 Oct 2016, 1 male (16.0 mm, pcl 12.0 mm), 1 female (8.8 mm, pcl 6.2 mm) (both sequenced, see Fig. 5).

Southern Kermadec Ridge, *basin near Brothers Volcano*: NIWA 86337, NIRVANA Stn TAN1213/45, 34°53.38–53.60′S, 179°2.33–2.16′E, 1680–1651 m, 24 Oct 2012, 1 female ov. (15.7 mm, pcl 11.4 mm; sequenced, see Fig. 5).

Kermadec Ridge, *Tangaroa Seamount*: NIWA 82155, NIWA Stn TAN1206/23, 36°20.15–20.29′S, 178°01.10–01.31′E, 1490–1422 m, 17 Apr 2012, 1 female (pcl 9.8 mm, rostrum broken).

Bay of Plenty: NIWA 83447, NIWA Stn TAN1206/176, 37°15.58–15.68′S, 178°0.96–0.76′E, 1540–1497 m, 01 May 2012, 1 female ov. (14.4 mm, pcl 10.3 mm); NIWA 83448, NIWA Stn TAN1206/176, 37°15.58–15.68′S, 178°0.96–0.76′E, 1540–1497 m, 01 May 2012, 1 female (9.2 mm, pcl 6.1 mm); NIWA 9011, NIWA Stn TAN0413/35, Otara Knoll, 36°57.57–57.69′S, 177°19.92–19.54′E, 1396–1462 m, 09 Nov 2004, 1 male (7.6 mm, pcl 5.5 mm), 1 female (6.7 mm, pcl 4.7 mm; sequenced, see Fig. 5).

Distribution. North Fiji Basin, Queensland, New Caledonia, 1497–2110 m; Bay of Plenty and Kermadec Ridge seamounts, 1396–1826 m (Fig. 183).

Habitat. *Uroptychus thermalis* was originally described from a hydrothermal vent from the North Fiji Basin, about 2,500 km north-east of New Zealand. The new records provided here extend the distribution along the Tonga Ridge and the Kermadec Ridge to the Bay of Plenty on the New Zealand continental shelf. Collections of new material were taken from seamounts that are in some cases hydrothermally active (Macauley, Brothers, and Tangaroa volcanoes); however, based on collection records and seabed images, there is no indication that the animals were living in the immediate vicinity of active thermal venting. In all cases, large corals were also collected at the same station and while isidid bamboo or primnoid gorgonians and large black corals were collected at some of the stations, chrysogorgiids were collected at all stations. A note was included with record NIWA 83447 that it was pulled off a *Chrysogorgia* and NIWA 83448 was pulled off a bamboo coral, so this species is in all likelihood associated with large anthozoans.

Diagnosis. Carapace dorsum without spines but with scattered scales and rugosities; gastric and cardiac regions well elevated; with distinct anterolateral spine, remaining lateral margins irregular but unarmed. Rostrum narrow triangular. Thoracic sternite 3 anterolaterally rounded, anterior margin with broad concavity and narrow median notch; laterally with small spine; sternite 4 anterolateral margin as long as posterolateral margin, short anterior spine. Basal antennal segment with distinct lateral spine, article 4 and 5 unarmed, antennal scale barely reaching end of article 4. Mxp3 unarmed. Cheliped slender, subcylindrical; 5–7 × pcl; with scattered scales or tubercles; merus with 1 or 2 large distal spines, carpus with or without dorsodistal spine; palm less than twice as long as finger, fingers distally spooned. Pereopods 2–4 similar, slender; P2 merus slightly shorter to slightly longer than pcl; propodi slightly widened on medial flexor margin bearing a group of 3–5 spines, remotely separated from single distal spine by concave, prehensile margin; dactylus with two distal spines, remotely separated from 5 or 6 small inclined spines on proximal half.

Colour in life. Unknown.

Remarks. *Uroptychus thermalis* is a distinctive species with the unique dorsal carapace sculpture and rugosities, slender appendages and arrangement of the spines on the P2–4 propodi and dactyli. It appears to be a rare species; the female holotype was the only specimen collected from an active vent (the "White Lady") at 2000 m in the North Fiji Basin; Ahyong & Poore (2004) reported a single male from nearly 1500 m on the Argo Bank, about 700 km east off Queensland and Baba (2018) reported a single female from around 2100 m off New Caledonia. The eight specimens collected along the Kermadec Ridge significantly increases the number of records to date and the material represents a range of sizes for both males and females. Examination of the New Zealand material of *U. thermalis* does highlights the apparent variation that has been already noted previously regarding the armature of the cheliped and the shape of the lateral sternite 4. For example, the distal ornamentation on the cheliped merus and carpus varies; Baba & de Saint Laurent (1992) describe the holotype as having one spine on the merus and the carpus unarmed, and both Ahyong & Poore (2004) and Baba (2018) illustrated the merus with two spines and the carpus with one distodorsal spine. The material examined here is nearly evenly split, with four of the eight specimens having two distal spines on the carpus and the merus with a small but distinct spine, and three having the merus with a single strong distal spine and the carpus unarmed (e.g. Fig. 181C, one specimen is missing the chelipeds). This variation was suggested to be allometric by Ahyong & Poore (2004), but this pattern is not apparent here. Additionally, DNA evidence from four specimens (NIWA 9011, 86337 and 118823) indicates more than one species might be present with > 7% sequence divergence, which supports Baba's (2018) conclusion that this species might have to be split. If differences in the cheliped armature reflect species differences, the two specimens from the southern Bay of Plenty (NIWA 9011) and the small female from Macauley Island (NIWA 118823) would be designated as *U. thermalis sensu stricto* while the remainder and the specimens reported by Ahyong and Poore (2004) and Baba (2018) would belong to a new species. However, this might be confounded by the morphology of the lateral margin of thoracic sternite 4 which, in the holotype, bears only a small spine and appears to be less elevated above sternite 3, which is apparently different for all other specimens reported after. All the New Zealand specimens show a distinctly elevated sternite 4 with at least a prominent blunt anterior spine (Fig. 181B). Clearly, further examination of all available material, including re-examination of the type, and in addition to further molecular analyses, are required before a decision can be made. Aspects of the morphology of both specimens of NIWA 9011 (both small, pcl 4.7, 5.5 mm) are illustrated (Fig. 181) but otherwise the material aligns well with *U. thermalis* as illustrated by Ahyong & Poore (2004, reproduced in Fig. 182).

The original accounts of *U. thermalis* by Baba & de Saint Laurent (1992) and Ahyong & Poore (2004) do not illustrate or note the dorsal abdominal tergite 1 as bearing a ridge. Baba (2018) clearly illustrates a median transverse ridge on tergite 1, which matches the appearance of the New Zealand material.

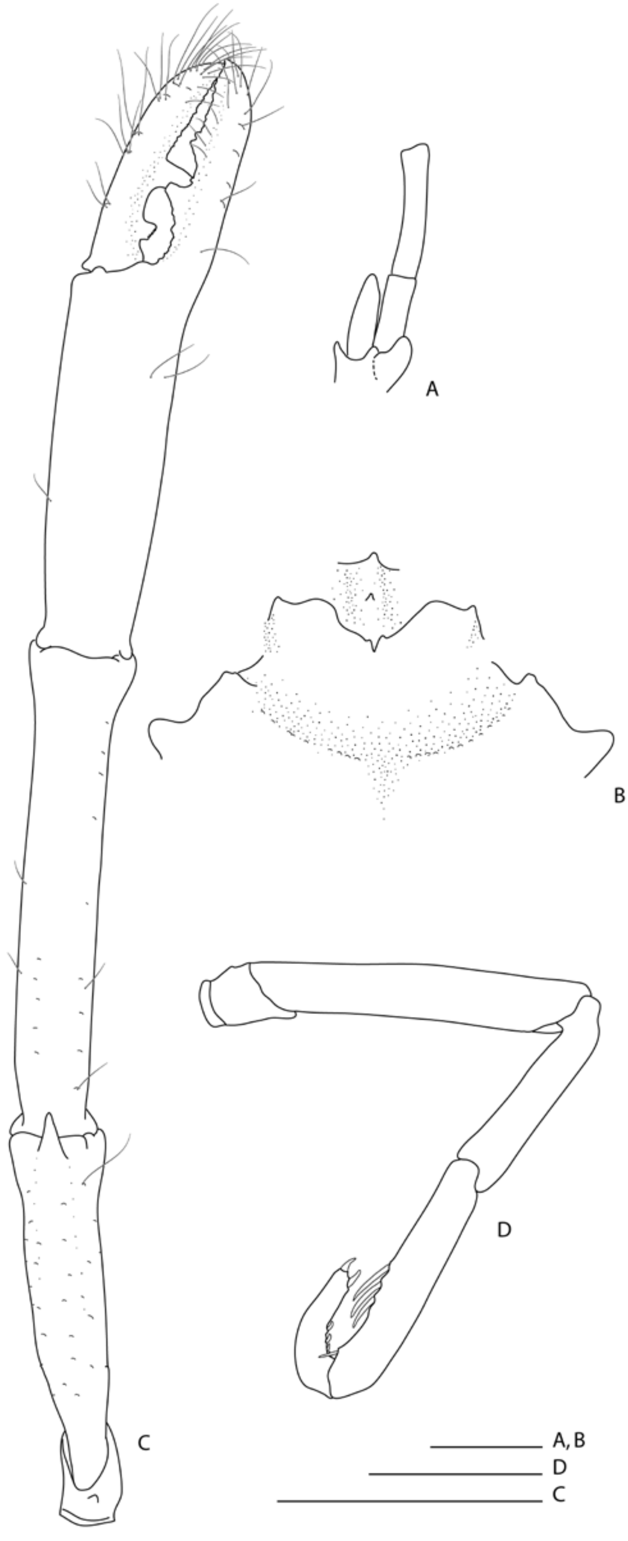


Figure 181. *Uroptychus thermalis* Baba & de Saint Laurent, 1992, NIWA 9011, A–C. male, pcl 5.5 mm; D. female, 4.7 mm: **A.** antenna, right ventral; **B.** excavated sternum and sternites 3 and 4; **C.** right cheliped, dorsal; **D.** P2, lateral. Scale bars = 2 mm.

Uroptychus thermalis most closely resembles *U. havre* **sp. nov.** from the Havre volcano on the Kermadec Ridge, differences are discussed under that species above. *Uroptychus sternospinosus* Tirmizi, 1964 also shares their overall appearance but can be separated based on the relative proportion of the carpi and

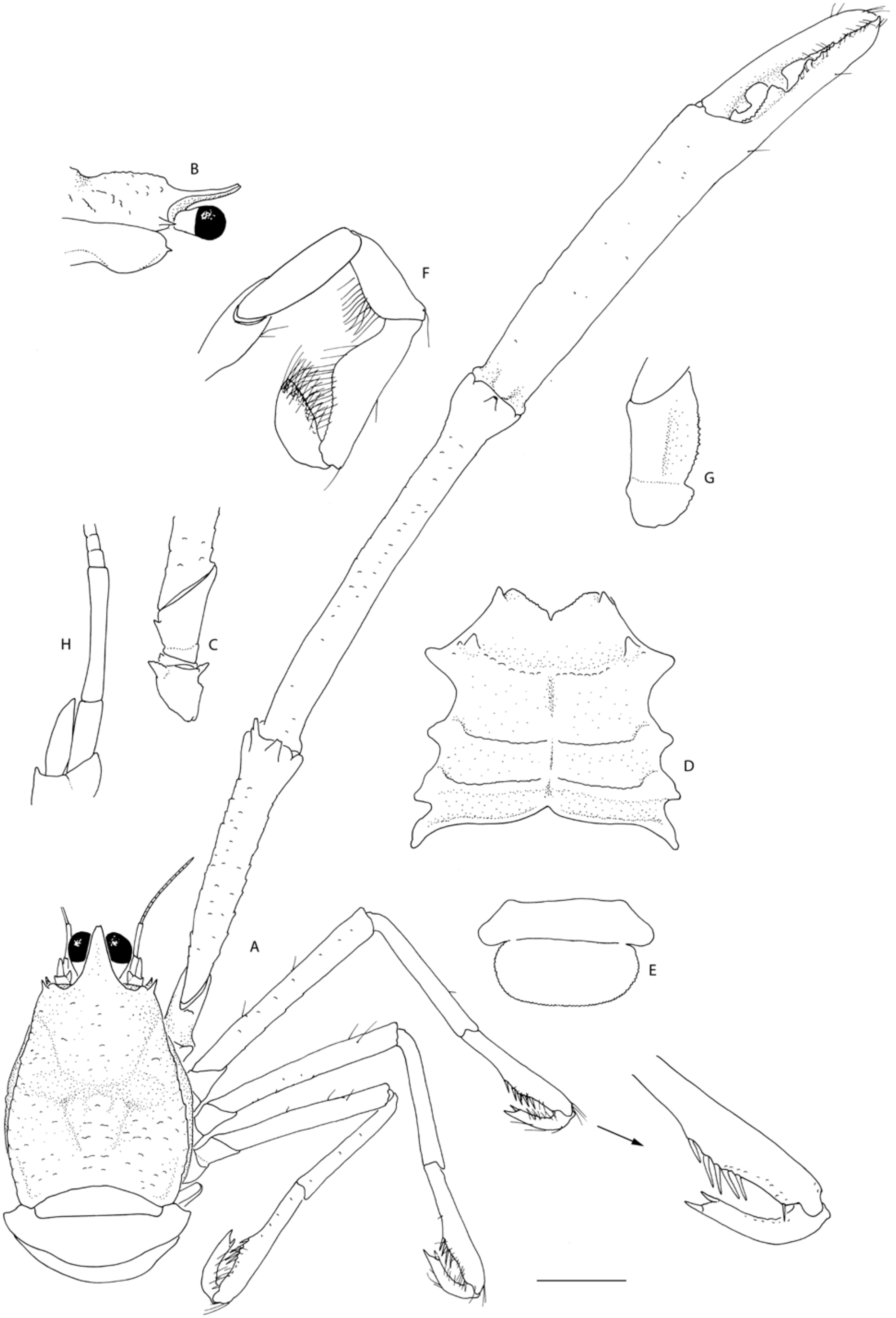
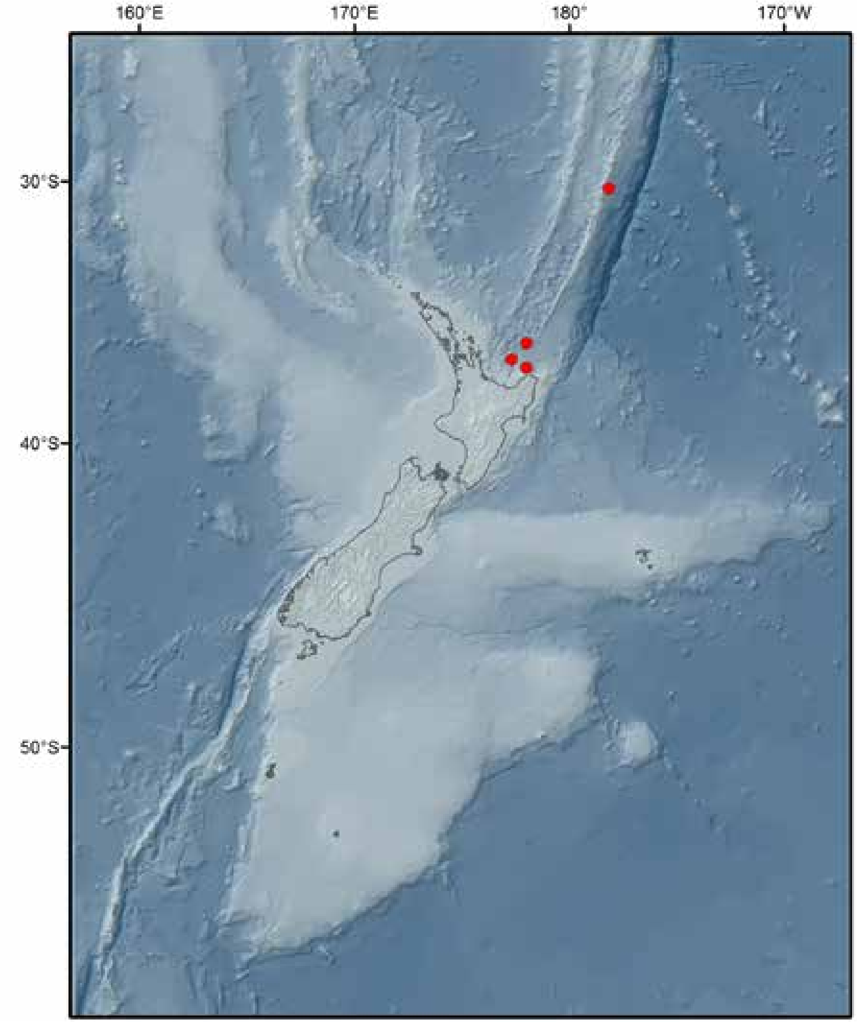


Figure 182. *Uroptychus thermalis* Baba & de Saint Laurent, 1992, male, cl 14.5 mm, Argo Bank, Queensland, AM P64922: **A.** dorsal habitus; **B.** anterior carapace, right lateral; **C.** cheliped, proximal right lateral; **D.** sternal plastron; **E.** telson. **F.** Mxp3, right lateral; **G.** crista dentata, right; **H.** antenna, right ventral. Scale A–C = 5 mm, D–H = 2.5 mm. After Ahyong & Poore (2004).

Figure 183. Distribution of *Uroptychus thermalis* Baba & de Saint Laurent, 1992 around New Zealand.



propodi of P2–4 (carpi long in *U. sternospinosus* and shorter in *U. thermalis*) and the presence or absence of a distinct longitudinal carina in the carapace midline (present in *U. sternospinosus*, absent in *U. thermalis*). Finally, in New Zealand *U. thermalis* is aligned with *U. remotispinatus* Baba & Tirmizi, 1979, based on the position of the spines on the P2–4 dactyli (separated into distal and proximal group) but they clearly differ in overall appearance with *U. remotispinatus* having a smooth carapace (rugose and deeply sculpted in *U. thermalis*), the P2–4 propodi lack a concave prehensile distal margin in *U. remotispinatus* (present in *U. thermalis*) and the distalmost angle of the propodi is unarmed in *U. remotispinatus* while it bears a pair of small spines in *U. thermalis*.

The large male collected from Macauley Island bears a sacculinid rhizocephalan externae under the abdomen.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 1.6–7.1%, the two largest specimens (NIWA 9011, 86337) are most similar to each other; the two smaller specimens were not only significantly different from these (2.5–7.1%) but also different from each other (6.1%). Interspecific sequence divergences: >10%

Uroptychus toka Schnabel, 2009 Figs 184, 185

Uroptychus toka Schnabel, 2009a: 568, fig. 14; Schnabel 2009b: 31 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 210 (list); Baba 2018: 523, figs 264, 265.

Type & locality. Holotype—NMNZ CR.012090, NZOI Stn K795, 33°02.59′S, 179°34.60′W, L'Esperance Rock, Kermadec Ridge, 350–490 m, female ov. (cl 5.3 mm).

Distribution. Off L'Esperance Rock, Kermadec Ridge, 350–490 m (Fig. 185), Vanuatu, Loyalty Ridge, and Norfolk Ridge, 304–450 m (Baba 2018).

Habitat. Unknown.

Diagnosis. Carapace (pcl) slightly wider than long; lateral margin without distinct spine but irregular, with serrated process on anterior branchial region, anterolateral spine smaller than lateral orbital spine (in dorsal view, nearly contiguous at base); dorsal surface with cluster of denticle-like spines and granules on lateral hepatic and epigastric regions, otherwise smooth and not distinctly inflated in any region. Rostrum at base about half width between anterolateral spines. Abdominal tergites smooth. Thoracic sternite 3 anterolaterally rounded, anterior margin with shallow concavity bearing U-shaped median notch flanked

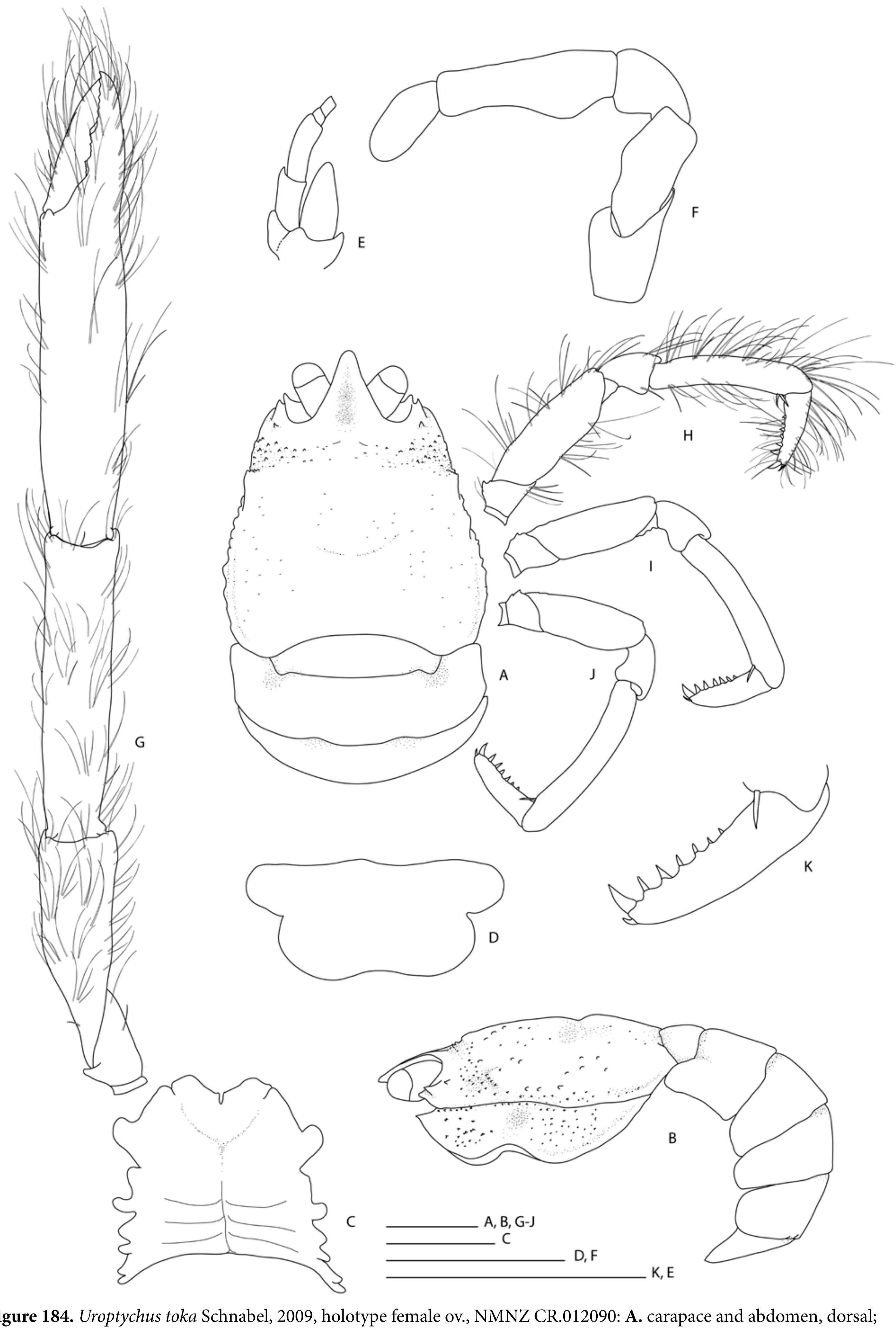
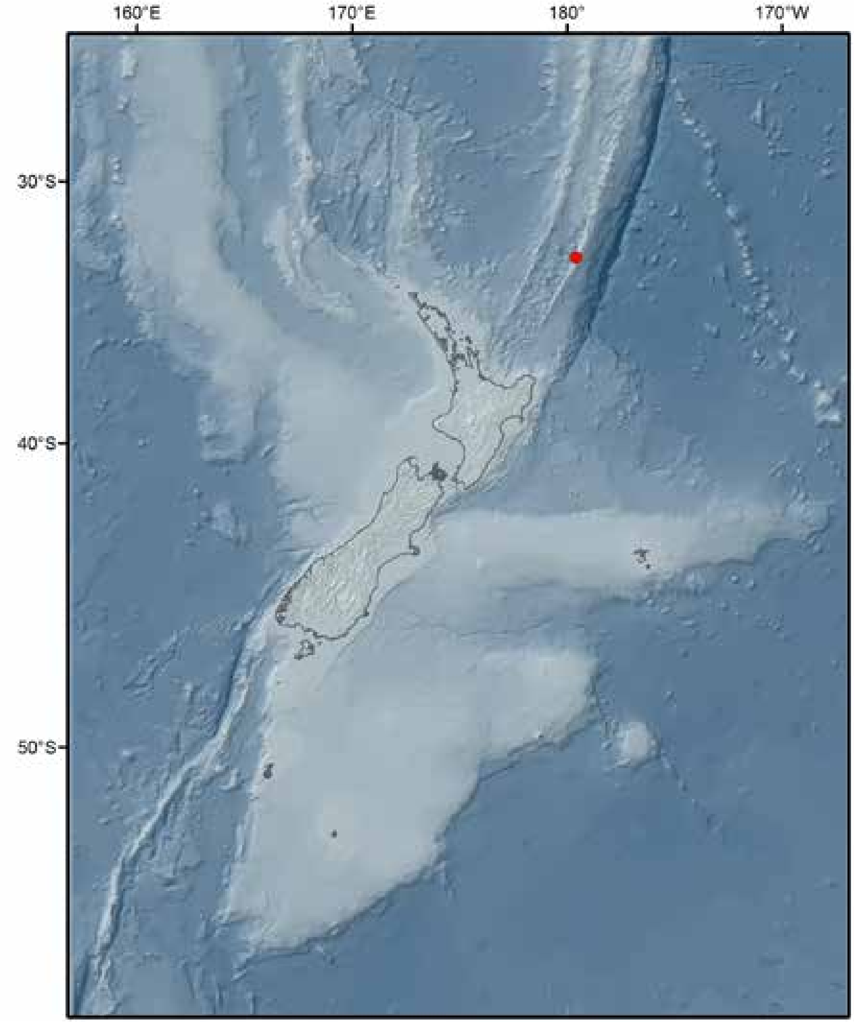


Figure 184. *Uroptychus toka* Schnabel, 2009, holotype female ov., NMNZ CR.012090: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral; **C.** sternal plastron; **D.** telson; **E.** antenna, left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** right cheliped, dorsal; **H–J.** right P2–4; **K.** dactylus and distal portion of propodus of right pereopod 2, lateral. Scale bars = 2 mm. After Schnabel (2009).

Figure 185. Distribution of *Uroptychus toka* Schnabel, 2009 around New Zealand.



by obsolescent submedian spines. Pereopods 2–4 dorsal margin of meri and carpi smooth; propodi with pair of distal spines on flexor margin only; dactyli distally tapering, with 6 to 8 sharp triangular spines, loosely arranged and perpendicular to flexor margin, ultimate spines small, penultimate about twice size of antepenultimate.

Colour in life. Not known.

Remarks. No further specimens of *U. toka* have been collected from the New Zealand region since the species was first described (Schnabel 2009a) but Baba (2018) reported six more specimens from Vanuatu, the Loyalty and Norfolk Ridges.

The excavated sternum was not documented in the original description of *U. toka,* but Baba (2018) illustrated and described it as "with somewhat rounded or bluntly triangular anterior margin, surface ridged in midline" (Baba 2018: 523). Unfortunately, the holotype was not available for re-examination during the preparation of this study.

Uroptychus toka closely resembles other small species that share the anterolateral spine of the carapace contiguous at base with the lateral orbital spine, in addition to the subparallel lateral sternite margins, short antennal scale and perpendicular arrangement of spines along the P2–4 dactyli (Fig. 184). Those species that most closely align are *U. helenae* **sp. nov.**, *U. rutua* Schnabel, 2009, *U. turgidus* Baba, 2018, and *U. volsmar* Baba, 2018. *Uroptychus toka* has the dorsal surface not inflated, while in *U. turgidus* the branchial region and in *U. rutua* and *U. helenae* **sp. nov.** the gastric regions are distinctly inflated. *Uroptychus toka* has the hepatic and epigastric regions covered with small denticles, while these are smooth in both *U. volsmar* and *U. turgidus*. In *U. toka* the Mxp3 is entirely unarmed, while the merus has a distal spine on the extensor margin in *U. helenae* **sp. nov.**, *U. volsmar*, and *U. turgidus*.

Uroptychus tomentosus Baba, 1974 Figs 186–190

Uroptychus tomentosus Baba, 1974: 384, figs 3, 4; Baba 2005: 231 (synonymies, keys); Baba *et al.* 2008: 44 (list and synonymies); Schnabel 2009a: 570, figs 15, 16; Schnabel 2009b: 31 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 210 (list); Baba 2018: 25 (key).

Type & locality (not examined). Holotype—ZLKU 15125, 45°14.3´ S, 171°29.2´ E, E coast of South Island, New Zealand, 116 m, male (cl 11.8 mm).

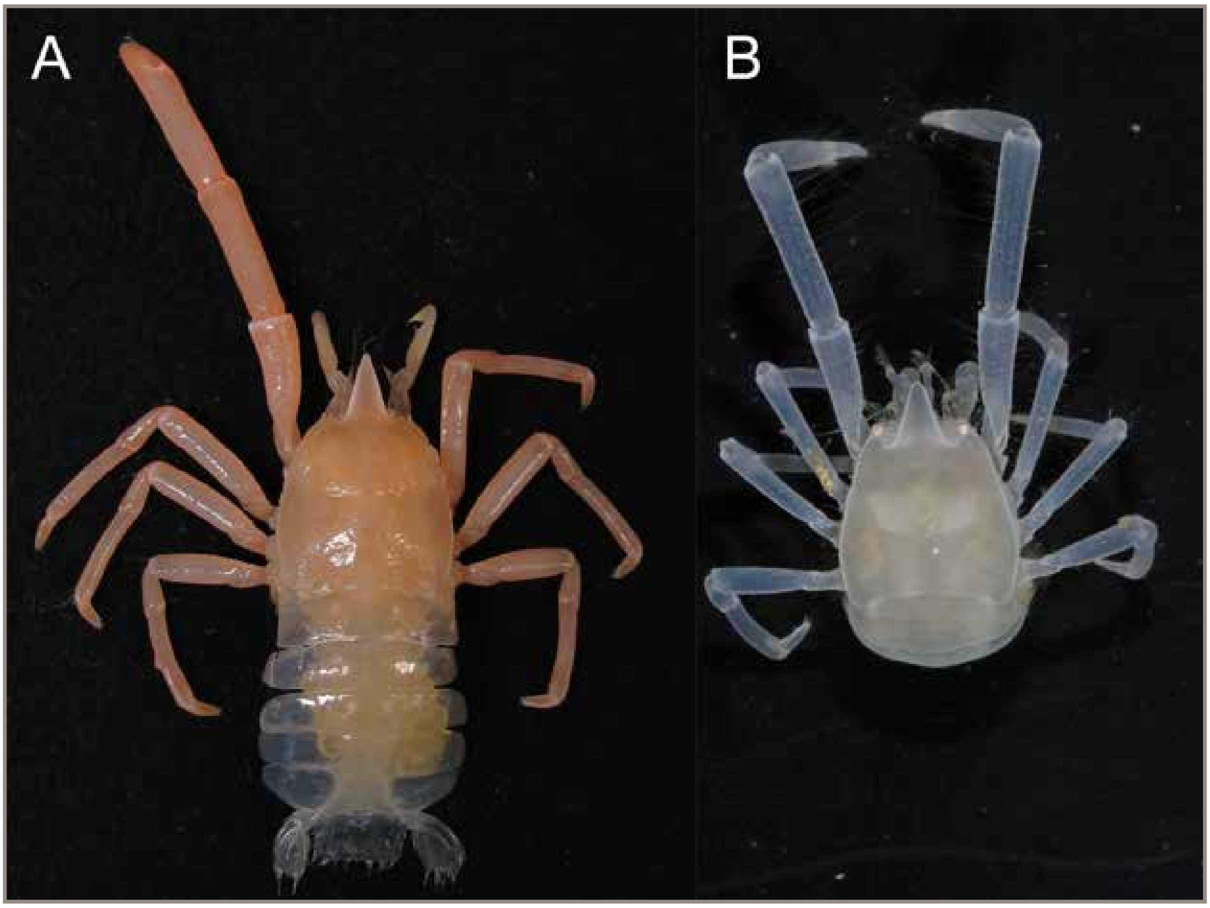


Figure 186. Live coloration of *Uroptychus tomentosus* Baba, 1974: **A.** NIWA 89901, female ov., pcl 14.3 mm; **B.** NIWA 57344, female ov., pcl 4.1 mm. Image courtesy of Peter Marriott, NIWA.

Other material. *Northland*: NMNZ CR.023771, NZOI Stn C771, 34°40.00′S, 173°27.00′E, 188–185 m, 20 Feb 1962, 1 male (5.2 mm, pcl 3.6 mm); NMNZ CR.023715, 34°50.00′S, 173°30′E, Doubtless Bay, 146–183 m, 4 females ov. (7.0, 6.0, 5.9, 5.1 mm, pcl 4.8, 4.3, 4.1, 3.6 mm), 4 females (7.0, 6.1, 5.7, 3.9 mm, pcl 4.7, 4.3, 4.0, 2.6 mm), 17 males (7.4–3.5 mm, pcl 4.9–2.3 mm), with many sacculinids.

Cape Brett: NMNZ CR.023815, 35°09.00′S, 174°19.80′E, 73 m, 10 Nov 1967, 1 male (5.1 mm, pcl 3.4 mm), from groper stomach; NMNZ CR.023821, 35°09.00′S, 174°19.80′E, 73 m, 10 Nov 1967, 1 male (4.9 mm, pcl 3.3 mm), from groper stomach; NMNZ CR.023739, Stn FRD 63/2, 35°13.00′S, 174°36.00′E, 174 m, 29 Mar 1963, 1 male (5.7 mm, pcl 4.0 mm), with small sacculinid; NMNZ CR.023753, Stn FRD 63/2, 35°13.00′S, 174°36.00′E, 174 m, 29 Mar 1963, 1 female (4.7 mm, pcl 3.2 mm), with large sacculinid.

East of Poor Knights Islands: NMNZ CR.015266, RV *Acheron* Stn 74365 (BS 265), 35°33.00′S, 174°57.00′E, 201–183 m, 14 Feb 1974, 1 female ov. (6.2 mm, pcl 4.3 mm), 1 male (4.8 mm, pcl 3.3 mm), on pennatulid; NMNZ CR.023740, Stn MC7, 36°40.20′S, 174°10.20′E, 46 m, 16 Mar 1958, 1 male (6.4 mm, pcl 4.2 mm), with small parasite (? entoniscid) projecting from thoracic cavity.

Bay of Islands: NIWA 57344, NIWA Stn TAN0906/232, 34°57.40–57.52′S, 174°05.25–05.66′E, 148–147 m, 19 Jul 2009, 1 female ov. (5.8 mm, pcl 4.1 mm).

Between Kaipara and Manukau Heads: NMNZ CR.023754, NMNZ Stn MC7, 36°40.20′S, 174°10.20′E, 46 m, 16 Mar 1958, 1 male (6.7 mm, pcl 4.6 mm), with ?cryptoniscid larvae; NMNZ CR.023752, Stn MC15, 2 Jan 1962, 1 female (4.9 mm, pcl 3.5 mm), with sacculinid.

Coromandel Peninsula, *east of Whitianga*: NMNZ CR.015259, Stn J16/32/84, 36°46.90′S, 176°13.35′E, 256–253 m, 23 Sep 1984, 1 female ov. (8.6 mm, pcl 6.1 mm), on pennatulid; NMNZ CR.023819, Stn Haul 2, 37°6.00′S, 176°13.98′E, 373 m, 23 Sep 1962, 1 male (6.2 mm, pcl 4.3 mm); NMNZ CR.023810, Stn Haul 2, 37°6.00′S, 176°13.98′E, 373 m, 23 Sep 1962, 1 female ov. (10.5 mm, pcl 7.4 mm); NMNZ CR.016907, NZOI Stn R107, 37°13.10–10.64′S, 176°07.80–08.90′E, 119–169 m, 22 Jan 1979, 1 female ov. (5.5 mm, pcl 3.8 mm); NMNZ CR.023720, NZOI Stn R101 (BS743), 37°21.90′S, 176°20.90′E, 203–248 m, 22 Jan 1979, 1 male (4.6 mm, pcl 3.2 mm).

Bay of Plenty: NIWA 105943, NIWA Stn KAH0102/1, 36°46.19′S, 176°14.29′E, 307 m, 30 Jan 2001, 1 female ov. (7.6 mm, pcl 5.4 mm), 1 female

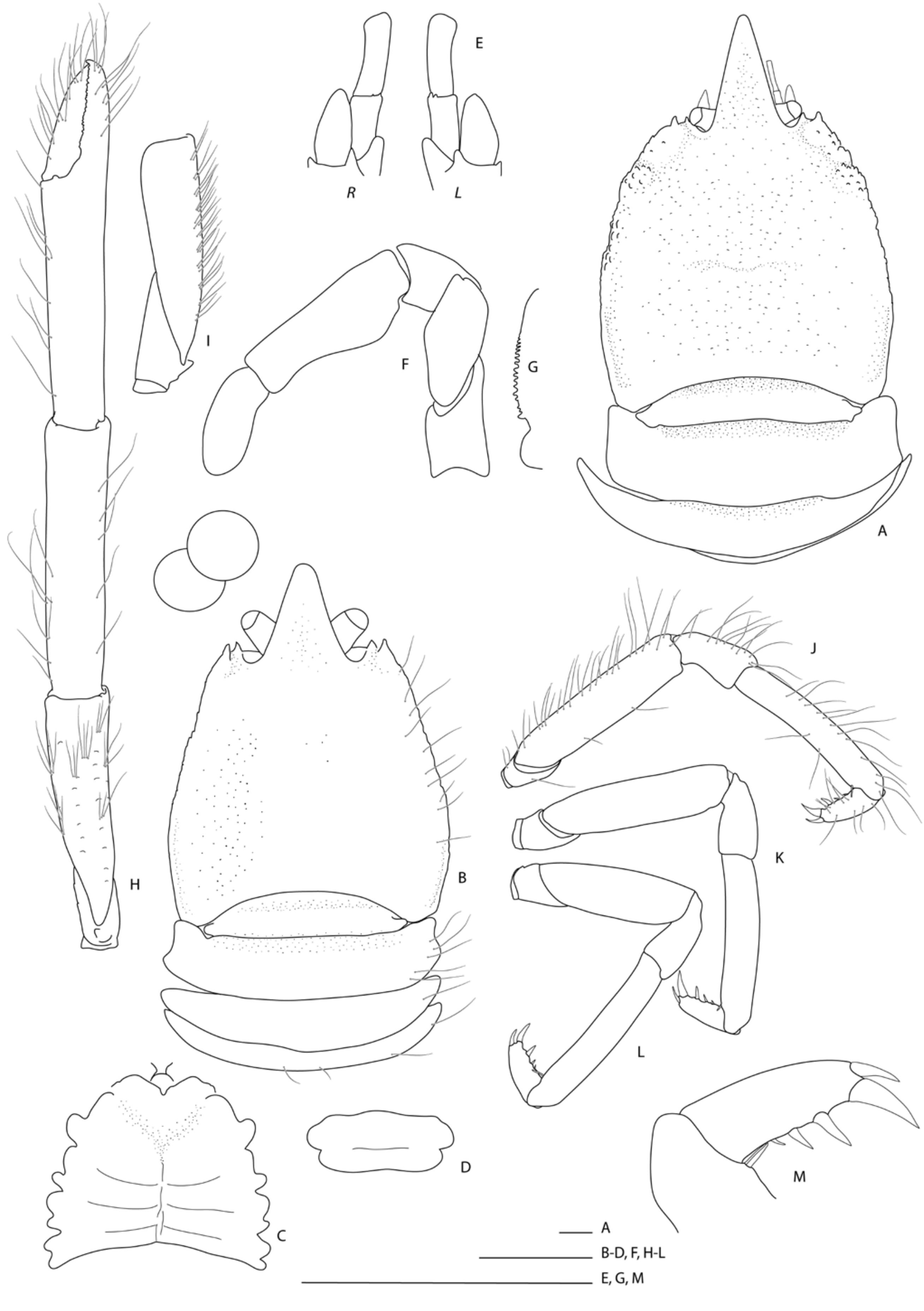


Figure 187. *Uroptychus tomentosus* Baba, 1974, A. female ov., NIWA 89901, B–M. female ov. NIWA 57344: **A, B.** carapace and abdomen, dorsal; **C.** excavated sternum and sternal plastron, ventral; **D.** telson; **E.** antennas, ventral; **F.** left Mxp3 endopod, lateral; **G.** Mxp3 crista dentata, left; **H.** right cheliped, dorsal; **I.** right cheliped ischiomerus, mesial; **J–L.** right P2–4; **M.** dactylus and distal portion of propodus of right P2, lateral. Scale bars = 2 mm.

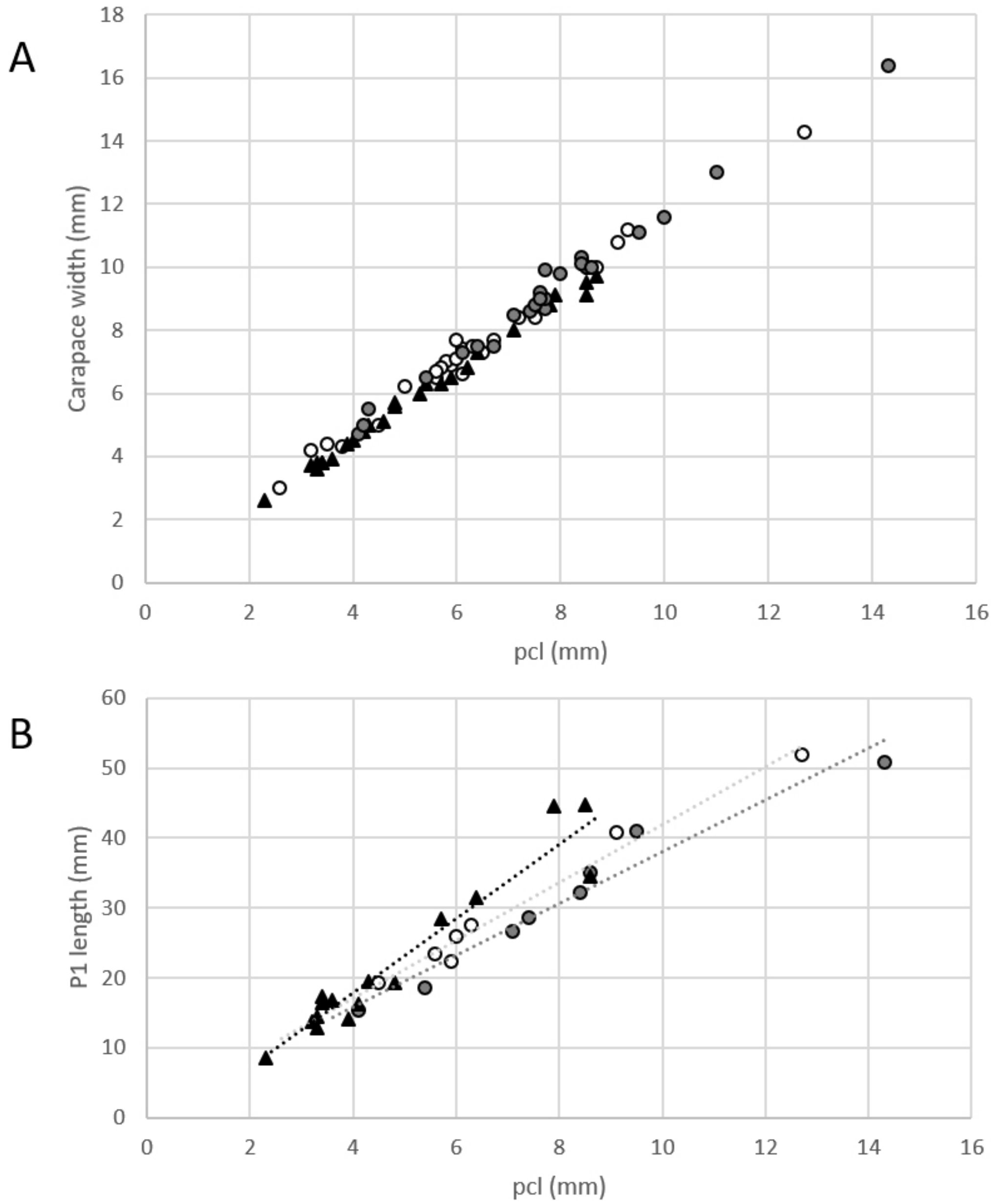


Figure 188. Meristic comparison of *Uroptychus tomentosus* Baba, 1974 for males (black triangle), females (white circles) and ovigerous females (grey circles): **A.** carapace width relative to postorbital carapace length (pcl) in mm; **B.** length of cheliped (P1) relative to postorbital carapace length (pcl) including trend lines for each.

(8.3 mm, pcl 5.9 mm), 2 males (7.2, 5.5 mm, pcl 4.8, 3.9 mm); AKM MA36929, Stn K414/71, Aldermen Islands, 36°56′S, 176°15′E, 284–302 m, 30 Nov 1971, 2 females (12.1, 8.8 mm, pcl 7.8, 5.5 mm).

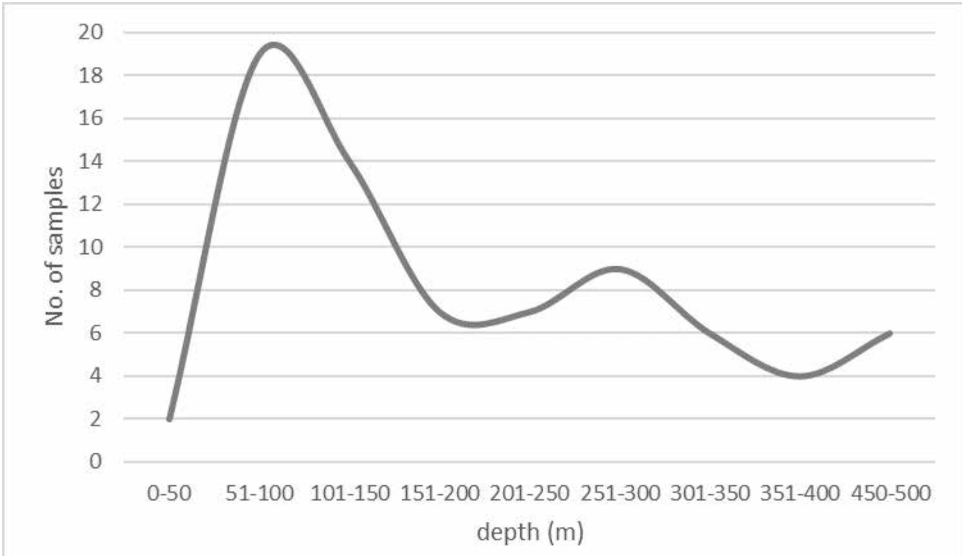
White Island: NMNZ CR.023811, Stn 1963/1, 37°31.98′S, 177°25.02′E, 192 m, 3 Apr 1963, 1 female ov. (6.2 mm, pcl 4.2 mm); NMNZ CR.023823, Stn 1963/1, 37°31.98′S, 177°25.02′E, 192 m, 3 Apr 1963, 1 male (7.1 mm, pcl 4.8 mm); NMNZ CR.023761, Stn MC10, 37°42.00′S, 176°33.00′E, 183 m, 1 male (8.7 mm, pcl 6.2 mm), with 2 sacculinids; NMNZ CR.023708, NZOI Stn B658, 38°39.00′S, 173°25.00′E, 143–144 m, 24 Oct 1962, 1 male (5.1 mm, pcl 3.4 mm).

Hikurangi Margin: NIWA 6030, NIWA Stn TAN1108/201, 38°40.94–41.30′S, 178°27.00–27.76′E, Ariel Bank, 267–292 m, 30 May 2011, 1 female (8.1 mm, pcl 5.7 mm); NIWA 75247, NIWA Stn TAN1108/202, 38°41.59–41.46′S, 178°28.81–28.62′E, Ariel Bank, 307–290 m, 30 May 2011, 1 male (8.0 mm, pcl 5.7 mm; sequenced, see Fig. 5); NMNZ CR.023820, Wairarapa, 40°55.98′S, 176°19.80′E, 110 m, 17 Sep 1956, 1 male (11.9 mm, pcl 8.5 mm); NMNZ CR.023824, 110–128 m, 25 Aug 1959, 1 male (7.6 mm, pcl 5.4 mm).

Cook Strait: NMNZ CR.023812, 41°22.20′S, 174°46.98′E, Wellington, 1 Oct 1956, 1 male (10.1 mm, pcl 7.1 mm); NMNZ CR.023742, 41°34.5′S,175°26′E, Titahi Bay, 73 m, 1 Oct 1956, 1 female (12.9 mm, pcl 9.1 mm), with large sacculinid.

Challenger Plateau: NIWA 33743, NIWA Stn TAN0707/138, 39°38.61–39.08′S, 172°09.48–09.73′E, 264–267 m, 07 Jun 2007, 1 female (6.5 mm, pcl 4.8 mm; sequenced, see Fig. 5).

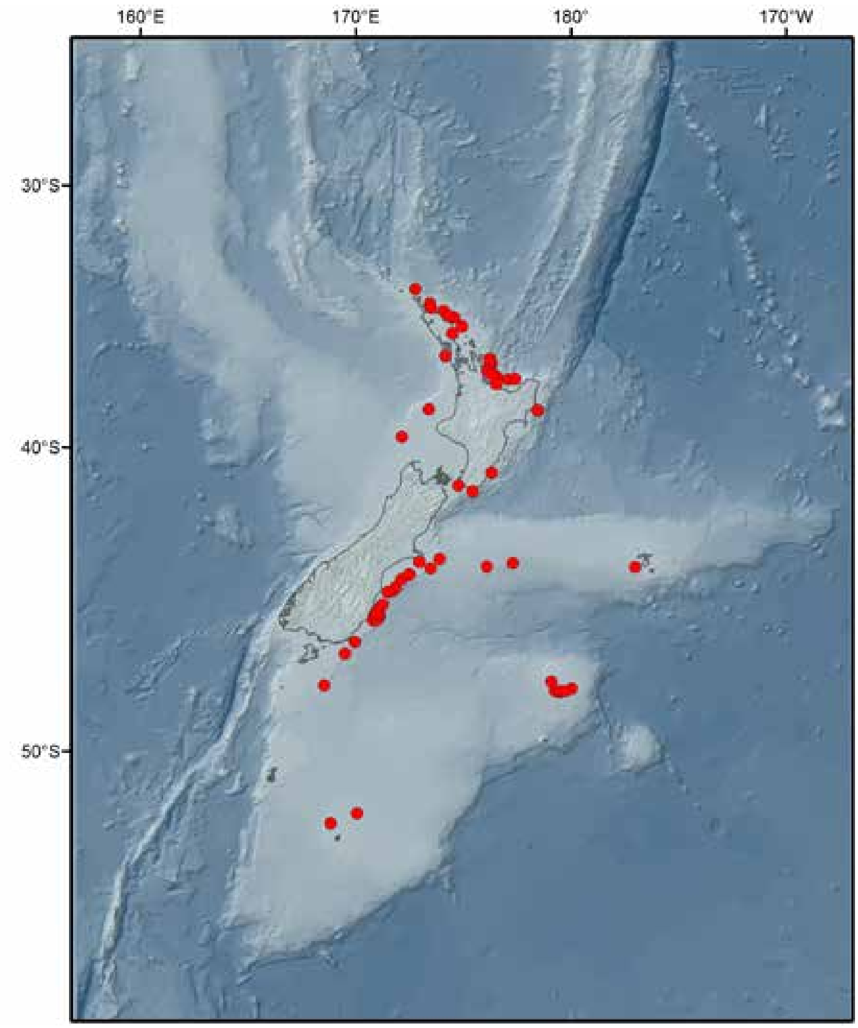
Figure 189. Depth distribution of *Uroptychus tomentosus* Baba, 1974.



Chatham Rise: AM P.102312 (ex NIWA 23149), NZOI Stn Q34, 44°10.20′S, 176°59.20′W, 278 m, 23 Mar 1978, 2 females (12.3, 16.8 mm); AM P.102311 (ex NIWA 23148), NZOI Stn S156, 44°12.30′S, 173°29.90′E, 327 m, 28 Oct 1979, 2 males (9.0, 10.7 mm); NMNZ CR.023719, Stn BS558, 43°30.00′S, 173°31.30′E, 446 m, 1 female ov. (7.5 mm); NMNZ CR.023711, NZOI Stn E106, 43°55.00′S, 177°10.00′W, 98 m, 11 Oct 1964, 1 female (8.7 mm, pcl 6.0 mm); NMNZ CR.015268, NZOI Stn B554, 44°0′S, 172°58.20′E, 81 m, 79, 06 Oct 1962, 1 male (8.3 mm, pcl 5.6 mm); NMNZ CR.023705, NZOI Stn B554, 44°0′S, 172°58.20′E, 81 m, 79, 06 Oct 1962, 1 female ov. (11.2 mm, pcl 7.6 mm); NMNZ CR.023744, NZOI Stn B554, 44°00′S, 172°58.20′E, 81 m, 79, 06 Oct 1962, 1 female (9.6 mm, pcl 6.5 mm); NMNZ CR.023756, Chatham Exped. Stn 51, 44°01.98′S, 177°19.02′E, 229 m, 10 Feb 1954, 1 male (12.0 mm, pcl 8.7 mm), with ?entoniscid isopod; NMNZ CR.023750, NZOI Stn G661, 44°25.00′S, 172°30′E, 93 m, 18 Jan 1970, 1 male (11.9 mm, pcl 7.8 mm), with *Thompsonia* akentrogonid.

Otago Coast: NMNZ CR.023817, 45°25.02′S, 171°15′E, off Moeraki, 73–91 m, 1951, 1 female (9.8 mm, pcl 7.5 mm); NMNZ CR.023710, NZOI Stn G674, 45°27.00′S, 171°12.00′E, 98 m, 19 Jan 1970, 1 female ov. (11.5 mm, pcl 7.6 mm); NMNZ CR.585, Stn BS189, 45°35.80′S, 171°2.60′E, edge of Canyon A, 219 m, 14 Aug 1955, 1 male (8.1 mm, pcl 5.9 mm), with small akentrogonid; NMNZ CR.012096, PMBS *Munida* Stn 8, 45°41.85′S, 170°58.72′E, 97–100 m, 10 May 1990, 2 females (8.6, 8.0 mm, pcl 6.1, 5.6 mm); NMNZ CR.023768, Stn BS 202, 45°44.00′S, 171°02.00′E, 137 m, 23 Jan 1957, 1 female (9.4 mm, pcl 6.7 mm), with *Thompsonia* akentrogonid; NMNZ CR.023758, PMBS *Munida* Stn 69–71, 45°44.00′S, 171°05.00′E, Taiarua Canyon, 380–384 m, 15 Jul 1969, 1 female (10.4 mm, pcl 7.2 mm), with sacculinid; NMNZ CR.587, Stn BS190, 45°45.40′S, 171°04.98′E, 549 m, 16 Aug 1955, 1 male (13.0 mm, pcl 8.5 mm); NMNZ CR.023717, PMBS *Munida* Stn 68–30, 45°46.00′S, 171°0.20′E, Taiaroa Canyon, gravelly sand, 210 m, 19 Jul 1968, 1 male (12.6 mm, pcl 8.6 mm), gravelly sand; NMNZ CR.586, Stn BS191, 45°47.00′S, 171°7.00′E, Canyon B, 457–548 m, 16 Aug 1965, 3 female ov. (11.0, 11.0, 9.6 mm, pcl 7.7, 7.5, 6.7 mm); NMNZ CR.023755, Stn BS191, 45°47.00′S, 171°07.00′E, Canyon B, 457–548 m, 16 Aug 1965, 1 male (9.1 mm, pcl 6.4 mm), with akentrogonid; NMNZ CR.025262, PMBS *Munida* Stn 66–57, 45°48.00′S, 170°55.00′E, Taiaroa Head, 81 m, 2 Nov 1966, 1 female ov. (12.6 mm, pcl 8.6 mm); NMNZ CR.023781, PMBS *Munida* Stn 70–43, 45°49.80′S, 170°49.80′E, ENE Cape Saunders, 72 m, 14 Oct 1970, 1 female ov. (11.2 mm, pcl 8.0 mm); NMNZ CR.015267, MV *Alert* Stn 55.9, 45°49.80′S, 171°04.80′E, Canyon E of Otago Heads, 549 m, 16 Aug 1955, 3 females ov. (14.4, 13.0, 9.1 mm, pcl 10.0, 9.5, 6.4 mm), 2 females (8.0, 6.6 mm, pcl 5.6, 4.5 mm); NMNZ CR.023738, PMBS *Munida* Stn 68–52, 45°54.50′S, 171°0.20′E, off headland between Papanui & Saunders Canyon Otago, 540–180 m, 21 Oct 1968, 1 female (8.8 mm, pcl 6.1 mm), with *Thompsonia* akentrogonid; NMNZ CR.023745, PMBS *Munida* Stn 68–52, 45°54.50′S, 171°0.20′E, off headland between Papanui & Saunders Canyon Otago, 540–180 m, 21 Oct 1968, 1 female (9.2 mm, pcl 6.3 mm), with *Thompsonia* akentrogonid; NMNZ CR.023729, Stn J22/018/70 (E5), 46°37.00′S, 169°58.00′E, off Nugget Point, 110 m, 1 female ov. (12.2 mm, pcl 8.4 mm); NMNZ CR.023757, Stn J22/018/70 (E5), 46°37.00′S, 169°58.00′E, off Nugget Point, 110 m, 2 females (13.5, 12.6 mm, pcl 9.3, 8.7 mm), with *Thompsonia* akentrogonid; NMNZ CR.023709, NZOI Stn F97, 48°00′S, 168°32.00′E, 134 m, 17 Jan 1965, 1 male (12.7 mm, pcl 8.6 mm); NMNZ CR.023706, NZOI Stn F122, 48°06.00′S, 180°3.00′E, 252 m, 26

Figure 190. Distribution of *Uroptychus tomentosus* Baba, 1974 around New Zealand.



Jan 1965, 1 female (7.1 mm, pcl 5.0 mm); NMNZ CR.023779, PMBS *Munida* Stn 69–172, SE Nugget, 100 m, 22 Nov 1969, 1 female ov. (11.4 mm, pcl 7.7 mm); NMNZ CR.023784, PMBS *Munida* Stn 70–76, Taiaroa Canyon, 400–320 m, 10 Aug 1970, 3 females ov. (12.2, 11.9, 10.3 mm, pcl 8.4, 8.5, 7.1 mm).

Otago Shelf: NIWA 49364, NIWA Stn KAH0905/72, 44°34.69–33.61 0′S, 172°08.88–11.20 E, 100–102 m, 30 May 2009, 1 male (11.8 mm, pcl 7.9 mm); NIWA 74693, NIWA Stn TAN1108/108, 45°55.5–54.98′S, 170°48.57–48.80′E, 83–84 m, 23 May 2011, 1 female ov. (11.2 mm, pcl 7.7 mm).

Bounty Plateau: NIWA 49079, SOP Stn TRIP1727/112, 47°53′S, 179°06′E, no depth information, 31 Jan 2003, 1 female (17.6 mm, pcl 12.7 mm), 1 male (12.7 mm, pcl 8.7 mm).

Campbell Plateau: NIWA 89901, NIWA Stn TAN1309/4, 51°50.74′S, 170°04.59′E, 299 m, 01 Sep 2013, 1 female ov. (20.4 mm, pcl 14.3 mm); NMNZ CR.023707, NZOI Stn D32, 52°08.00′S, 168°50.00′E, 188 m, 3 May 1963, 1 female ov. (15.3 mm, pcl 11.0 mm).

Distribution. New Zealand continental shelf, from North Cape to Bounty Plateau and Campbell Rise (Northland Plateau, Bay of Plenty, Challenger Plateau, Hikurangi shelf, Chatham Rise, Otago Shelf), 46–549 m (Fig. 190).

Habitat. *Uroptychus tomentosus* is the most common shallow continental shelf species in New Zealand and is collected in habitats dominated by soft sediments. A few collection notes indicate that *U. tomentosus* associates, at least in some cases, with cnidarians: a pair was trawled up on an anemone by a fishing vessel (NIWA 49079, off Otago coast); one specimen was preserved in a jar containing two pennatulids (*Anthoptilum* sp. and *Umbellula* sp., NMNZ CR.015259, Bay of Plenty) and a note with a pair of specimens placed them on an unidentified pennatulid (NMNZ CR.015266, east off Poor Knights Islands).

Diagnosis. Carapace (pcl) 0.8–0.9 × width; dorsally and laterally unarmed, covered with fine setae and granular in large specimens. Anterolateral spine of moderate size, slightly larger than and barely overreaching tip of lateral orbital spine. Rostrum relatively wide (basal breadth about half distance between anterolateral spines), distally rounded. Pterygostomian flap granulate, anterior portion covered with serrate ridges, with sharp anterior spine. Sternal plastron wider than long, sternite 3 anterolaterally rounded, anterior margin with semicircular median notch. Cornea small. Antennal scale short (barely reaching end of article 4 to reaching midlength of article 5); article 4 with small or obsolescent spine or two miniscule spines distomesially; article 5 unarmed. Cheliped unarmed other than short, blunt distodorsal spine on ischium. P2–4 meri and carpi unarmed; propodi with distal pair of small spines only; dactyli short (0.3–0.4 × length of propodi), distally narrowed; with 3–6 sharp triangular and slightly obliquely directed spines along flexor margin, penultimate prominent, ultimate and antepenultimate subequal in size.

Colour in life. Several comments on colour have been noted: 'uniform pale warm pink' (NMNZ CR.025262, pcl 8.6 mm; NMNZ CR.023781, pcl 8.0 mm; NMNZ CR.023729, pcl 8.4 mm), 'pale yellowish pink' (CR.015267, pcl 5.6 mm) and 'uniform warm pink' (CR.023784, pcl 7.1–8.5 mm). The live coloration is shown for the larger ovigerous female (NIWA 89901, Fig. 186A), which is uniformly pale orange/pink with a transparent abdomen, and small specimens appear to be transparent white (NIWA 57344, Fig. 186B),

Variation. *Uroptychus tomentosus* is easily distinguished by the short P2–4 dactyli (about 1/3 the length of the propodi) that bear 3–6 spines, sternite 3 with rounded anterolateral margin and a U-shaped median notch, short antennal scale and typically rounded rostral apex. Most specimens are densely setose, with the cheliped bearing tufts of setae along the dorsal surface of the meri and carpi, but this varies somewhat. The degree of rugosity across the dorsal carapace surface, the pterygostomian flap, and the cheliped also varies apparently with size, the smaller specimens being typically smoother than the large specimens (e.g. Fig. 187B). In the largest specimens, the hepatic region and the lateral branchial margin are clearly granulose, and the anterior branchial area is furnished with a raised granulated process (Fig. 187A). However, distinct spines are always absent.

Variation is also apparent in the size of the spine on the antennal article 4, ranging from a minute/obsolescent spine (11 of 25 examined) to distinct small spines (12 of 25 examined) and two small spines in two specimens (similar to the antenna illustrated by Schnabel [2009a: fig. 15E]). The antennal scale ranges from barely reaching the end of (10 out of 25), clearly overreaching (9 out of 25), and reaching midlength of article 4 (6 of 25).

Rostral length varies from 0.3 to nearly 0.6 × pcl but is in most cases around 0.4–0.5 × pcl, and the basal width is about half the distance between the anterolateral spines and distinctly rounded anteriorly.

Sexual dimorphism. Fifty-five percent of the 102 specimens of *U. tomentosus* examined are female, split evenly as ovigerous and non-ovigerous; 45% were male. Females ranged in pcl size from 2.6 to 14.3 mm and ovigerous females from 3.6 mm. Males had smaller pcl (2.3–8.7 mm) but growth and size were linear and overlapped for both sexes (Fig. 188A). The size of the cheliped ranged significantly, from 3.5 to 5.6 × pcl, with the relative size of cheliped for males larger compared to females of the same size, a pattern that is seen in other species (e.g. see *U. ahyongi* **sp. nov.**, *U. cardus,* or *U. torrancei*) (Fig. 188B). However, the cheliped palm was not significantly more massive in males compared to females (not shown).

The largest ovigerous female (NIWA 89901, pcl 14.3 mm) carried 39 well-advanced eggs of 2.0–2.5 mm diameter, two smaller females (pcl 4.2, 4.1 mm) carried 12 and 13 eggs (1.0–1.2 mm diameter), respectively.

Parasitism and ecology. The infestation rate of specimens with either akentrogonid (7 samples, e.g. NIWA 49364, NMNZ CR.023738) or kentrogonid (13 samples, e.g. NIWA 105943, NMNZ CR.023715) rhizocephalan mesoparasites is higher than with other species examined. Unusually, a male specimen has two large kentrogonid externae under its abdomen (NMNZ CR.023761, pcl 6.2 mm). The parasites occur throughout their distribution range. Additionally, cryptoniscid isopods were dissected out of the abdomen of three specimens; these included endoparasitic larvae and a mesoparasitic adult (NMNZ CR.023756, 23754 and 23740, respectively). So far, the latter appear to not have been reported in this genus (Boyko & Williams 2011).

Two specimens were extracted from a New Zealand groper (*Polyprion oxygeneios*) stomach (NMNZ CR.023815, CR.23821) from off Cape Brett.

Remarks. *Uroptychus tomentosus* Baba, 1974 is one of the most abundant species in the collections, but samples mostly date back to collections from the 1950s to the 1970s. These collections were primarily made on the New Zealand continental shelf (< 200 m), with more recent sampling (since 1990) focussed on deeper waters (> 200 m) and offshore areas. The exceptions are two continental shelf surveys, in 2009 (Ocean Survey 20/20 Bay of Islands survey) and 2011 (Ocean Survey 20/20 Biogenic Habitats surveys), which collected three samples between 83 and 148 m. This species inhabits nearly the entire New Zealand continental shelf area, from the North Cape to the Snares, the Chatham Rise, the Campbell Rise and Bounty Plateau with about 80% collected at depths < 300 m and the majority collected at 51–100 m (19 of 72 stations, Fig. 189).

Uroptychus tomentosus most closely resembles

U. enriquei known from offshore islands north of New Zealand and the differences are discussed under the account of the latter. *Uroptychus tomentosus* is also similar to *U. pilosus* Baba, 1981, from Japan and *U. inaequalis* Baba, 2018, from the Tasman Sea; in *U. tomentosus* the anterolateral angle of the carapace always bears a spine, while it is rounded in both the other species, and the P2–4 dactyli have a number of spines in addition to a distal pair (only a distal pair is present in both *U. pilosus* and *U. inaequalis*).

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.6% (two specimens, NIWA 75247, 33743). Closest interspecific sequence divergences: 12.2–12.6% (*U. enriquei*), 12.3% (*U. sadie* **sp. nov.**).

Uroptychus torrancei sp. nov. Figs 191–193

Material examined. Holotype NIWA 61870, Stn Z8883, 37°25.4–26.0′S, 176°53.0–54.1′E, Bay of Plenty, 464–631 m, 06 Aug 1997, female (4.9 mm, pcl 3.2 mm). **Paratypes** *Hikurangi, eastern Ritchie Bank*: NMNZ CR.023682, FV *Otago Galliard* Stn G03/81/86, 39°26.7–26.3′S, 178°23.9–23.9′E, 910–950 m, 8 Jul 1986, 1 female (6.2 mm, pcl 4.0 mm), 1 male (3.0 mm, pcl 1.9 mm); NIWA 23367, same station details as holotype, 1 male (3.0 mm), 2 female ov. (3.5, 3.4 mm). *Chatham Rise*: NIWA 49472, SOP Stn TRIP2744/190, 43°57′S, 174°30′W, 748–936 m, 15 Jan 2009, 1 female (6.4 mm, pcl 4.3 mm; sequenced, see Fig. 5), 1 male (5.3 mm, pcl 3.5 mm); NMNZ CR.22312, SOP Stn TRIP2361/94, 44°26′S, 174°56′W, 1080 m, 1 female ov. (7.2 mm, pcl 4.8 mm), on large black coral (*Triadopathes*) (R. Stewart, NIWA, pers. comm.); NIWA 65868, SOP Stn TRIP2955/125, 44°32′S, 177°19′W, 668–969 m, 21 Oct 2009, 1 female ov. (6.7 mm, pcl 4.8 mm). *Campbell Plateau*: NIWA 23366, SOP Stn Z10163, 49°06–02′S, 166°07–40′E, 643–500 m, 27 Jun 1999, 1 female ov. (7.3 mm, pcl 4.7 mm), off black coral.

Other material. *Chatham Rise*: NIWA 49478, SOP Stn TRIP2744/187, 43°55′S, 174°41′W, 614–807 m, 15 Jan 2009, 10 females ov. (7.0, 6.9, 6.6, 6.0, 5.8, 5.8, 5.8, 5.8, 5.7, 5.5, 5.5 mm, pcl 4.6, 4.6, 4.5, 3.8, 4.0, 3.9, 3.8, 3.8, 3.8, 3.7, 3.6 mm), 5 females (6.7, 5.8, 4.5, mm, pcl 4.5, 3.9, 3.1 mm broken rostrum, pcl 3.9, 3.5 mm), 7 males (6.0, 6.0, 4.7, 4.7, 4.5, 4.5, 4.0 mm, pcl 4.0, 3.8, 3.0, 3.0, 3.0, 2.9, 2.6 mm); NIWA 23137, Fisheries Stn Z9160, SMT9801/38, 36°31.17′S, 176°29.79′E, 912 m, 24 Jun 1998, 41 specimens not measured (range of pcl 5.6–1.8 mm).

Hikurangi Margin, east of Cape Kidnappers: NMNZ CR.015255, RV *James Cook* Stn J10/40/86, 40°1.50′S, 178°3.30′E, 935 m, 28 Aug 1986, 3 females ov. (6.8, 5.5, pcl 4.6, 3.9 mm and broken carapace), 2 females (6.3, 5.9 mm, pcl 4.3, 4.0 mm), 3 males (6.8, 6.5 mm, pcl 4.4, 4.0 mm, broken rostrum, pcl 5.5 mm).

Status uncertain. *Uroptychus* cf. *torrancei*: NIWA 9801, SOP Stn Z9173, 37°2′S, 176°41′E, Bay of Plenty, 1003–1108 m, 05 Jul 1998, 1 male (6.3 mm, pcl 3.8 mm).

Type locality. Bay of Plenty, 464–631 m.

Distribution. Eastern New Zealand, Bay of Plenty, Hikurangi Margin, Chatham Rise, Campbell Plateau, 464–950 m (Fig. 193).

Habitat. *Uroptychus torrancei* **sp. nov.** appears to be associated with black corals, given that specimens were either removed or washed off black coral in the field, or are preserved with parts of black corals; NIWA 49478, NIWA 49472, NMNZ CR.015255 and NMNZ CR.022312 were picked from branches of *Triadopathes* sp. (identified by Dennis Opresko, USNM, and Rob Stewart, NIWA), and the female (NIWA 65868) was preserved with an unidentified black coral.

Diagnosis. Body moderately to strongly plumose. Carapace dorsally smooth; strongly convex from side to side; unarmed other than anterolateral spine (granule at anterior branchial margin, slightly serrated along posterior branchial portion). Anterolateral spine directed anteriorly (not anterolaterally). Lateral orbital spine well-developed, subequal in size to anterolateral spine, nearly reaching tip of anterolateral spine. Rostrum narrow triangular; lateral margin with 1 or 2 subapical spines. Anterior margin of sternite 3 V-shaped, submedian spines and notch absent. Ocular peduncle about 1.4 × longer than broad. Antennal scale overreaching antennal article 5, reaching second annulation of antennal flagellum; basal antennal article 2 with small lateral spine; articles 4 and 5 each with distal spine. Cheliped 2.7–4 × pcl; merus and carpus with tubercles or small spines along the mesial surfaces and usually strong distoventral spines, otherwise covered with short setiferous ridges. P2–4 similar; merus dorsal margin unarmed; carpus shorter than dactyli (at least on P2); propodus flexor margin with 3–6 spines along distal one-third, in addition to distal pair of spines; slightly inflated medially on P2, indistinctly so on P2–3. P2–4 dactylus distally narrowing, with 7 or 8 large and sharp triangular spines, oblique along flexor margin; ultimate, penultimate and antepenultimate subequal in size and arranged equidistantly.

Description. Carapace: pcl 0.8–1.0 [0.9] × width, strongly convex from side to side. Dorsal surface smooth, unarmed; cervical groove indistinct (faintly indicated). Lateral orbital spine sharp. Anterolateral spine well-developed, directed anteriorly, subequal in size to lateral orbital spine, tips of both spines reaching to about same level; lateral carapace margins slightly

Figure 191. *Uroptychus torrancei* **sp. nov.**, A–L. holotype female, NIWA 61870; M. female, NIWA 49478: **A.** carapace and abdomen dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antennae, left and right, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata of Mxp3, left, lateral; **H.** left cheliped, dorsal; **I.** right cheliped, proximal articles; **J–L.** right P2–4, **M.** dactylus and distal portion of propodus of right pereopod 2, lateral. Scale bars = 2 mm.

convexly divergent posteriorly, unarmed but irregular, with granule on hepatic margin, minute spines or granules at anterior angle of branchial margin, and regular granules or minute spines on posterior branchial margin; posterolateral corner rounded, without distinct ridge. Rostrum narrow triangular (width ≤ 0.5 × distance between anterolateral spines), slightly deflected ventrally, [0.5]–0.6 × pcl; 1.3–1.6 [1.4] × longer than wide at base; dorsal surface smooth and excavated, sparsely setose; lateral margin typically with subapical spine. Pterygostomian flap surface anteriorly with scattered granules; anterior margin produced into a spine.

Thoracic sternum: Excavated sternum with convex anterior margin and smooth midline. Sternal plastron 1.3–[1.4] × as wide as long, sternites 5–7 laterally slightly convex; surface smooth. Sternite 3 anterolaterally produced, anterior margin with deep V-shaped excavation; slight indication of median notch, submedian spines absent; lateral margins crenulated and produced to small spine at lateral corner. Sternite 4 1.9 × as wide as sternite 3, anteriorly shallow concave, midline ungrooved; anterolateral margin round, distinctly crenulate anteriorly; laterally unarmed. Sternite 5 anterolateral margin rounded and irregular.

Abdomen: Tergites smooth, unarmed. Tergite 1 with slight transverse ridge. Telson [2.8]–3.0 × as broad as long; posterior margin emarginated; posterior portion [1.1]–1.4 × length of anterior portion.

Eyes: Smooth. Cornea subglobular, 0.4–[0.5] × length of ocular peduncle.

Antennal peduncle: Article 2 with small but distinct outer spine. Article 3 unarmed. Article 4 and 5 with small distal spines each; mesial margins unarmed; article 5 [1.6]–1.8 × as long as article 4. Antennal scale overreaching peduncle, reaching end of second annulation of flagellum; 3.7–[4.0] × as long as wide.

Maxilliped 3: Coxa unarmed. Basis smooth along mesial ridge. Ischium without distal spines; crista dentata with about 50 tiny denticles. Merus with distolateral spine; flexor margin with 2 or [3] spines distal to midlength. Carpus extensor margin with distal spine, occasionally with minute median spine.

Cheliped: Stout; 2.7–4 [3.6] × pcl; surface setose. Ischium with distodorsal and distoventral spines and with row of spinules on ventromesial margin. Merus covered with setiferous tubercles and scattered spines along mesial surface; with 2 distoventral spines and row of proximal denticles. Carpus surface smooth and glabrous; with 2 distoventral spines and row of distodorsal denticles; length 0.8–1.0 × that of palm. Palm 1.7–2.9 [2.6] × as long as wide, sparsely covered with long setae. Dactylus 0.5–0.8 × as long as propodus; occlusal margins denticulate, without gape.

Pereopods 2–4: Similar; surface slightly setose. Merus dorsal margin unarmed; ventral margin without spines but occasionally acuminate distally, at least on P2; 0.9–0.7 × as long as propodus (shortening from P2 to P4); P4 merus 0.8 × as long as P2 merus. Carpus unarmed, shorter than dactylus (at least on P2). Propodus 4.1–4.7 × longer than wide; extensor margin smooth; flexor margin slightly inflated, at least on P2 (indistinctly in smaller specimens) with 2–6 spines along distal one-third of length, in addition to distal pair; 1.5–1.6 × as long as dactylus. Dactylus gently curved; flexor margin with 7–9 (typically 7) spines along entire length, all sharp triangular; ultimate spine slightly larger or subequal in size to penultimate and antepenultimate; moderately oblique, loosely and regularly arranged along flexor margin.

Ovum. Ovigerous female (NIWA 49478, pcl 3.8 mm) with 8 eggs of 1.2–1.5 mm in diameter. Three females (NMNZ CR.015255, pcl 4.6, 3.9 and a broken carapace) with 8–13 eggs, diameter 1.0–1.2 mm.

Colour in life. Frozen specimens were noted as bright pink/red.

Etymology. Named after Rob Torrance, with many thanks for his support and encouragement.

Remarks. *Uroptychus torrancei* **sp. nov.** has a unique combination of characters with a small size (pcl 2–5 mm), strong lateral orbital spine, subapical spines on the rostrum, the V-shaped anterior margin of sternite 3 (notch is absent), six to eight very strong spines on the P2–4 dactyli, slightly inflated flexor margin of P2 propodi and long antennal scale reaching the end of the second annulation of the antennal flagellum (Fig. 191). Variation among these specimens includes varying density of setation, with some specimens, mostly females, densely setose, while some specimens, mostly males, are only sparsely covered with fine setae on the body, but the distal portions of the chelipeds are usually still furnished with long setae and tufts of plumose setae. The distal flexor margin of P2 and often also P3–4 propodi, is inflated in most specimens (e.g. Fig. 191M). This feature is less developed in small specimens and may not be obvious (e.g. only very slight on P2 of holotype, Fig. 191J).

Males of *U. torrancei* **sp. nov.** tend to be slightly smaller than females (pcl 1.8–4.4 mm, pcl 5.5–7.0 mm in ovigerous females) but carapace length-width proportions appear to proceed linearly for both sexes (Fig. 192A). The relative cheliped length in relation to carapace length increases faster in males than in females (Fig. 192B), which is not uncommon, with sexual dimorphism in decapods often represented by

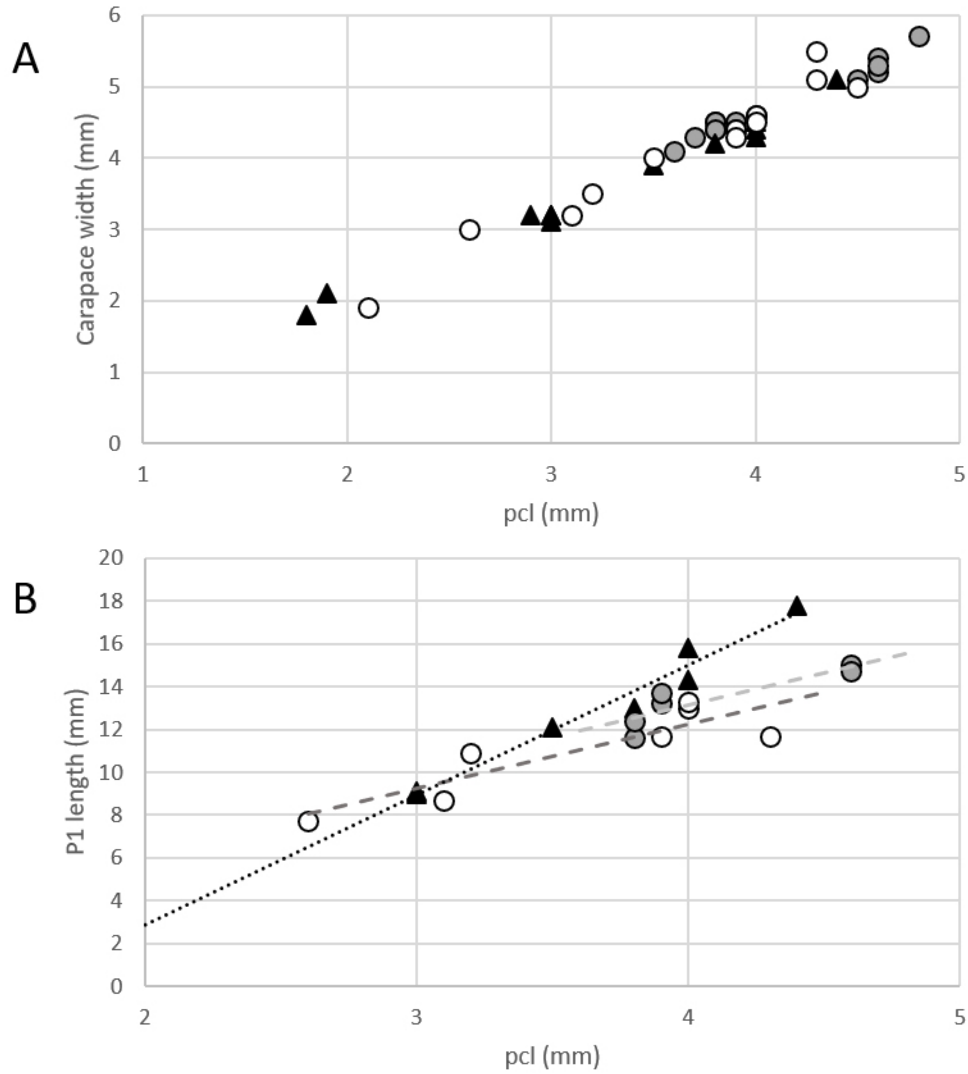


Figure 192. Meristic comparison of *Uroptychus torrancei* **sp. nov.** for males (black triangle), females (white circles), and ovigerous females (grey circles): **A.** carapace width relative to post-orbital carapace length; **B.** Length of cheliped (P1) relative to postorbital carapace length (pcl) including trend lines for each sex.

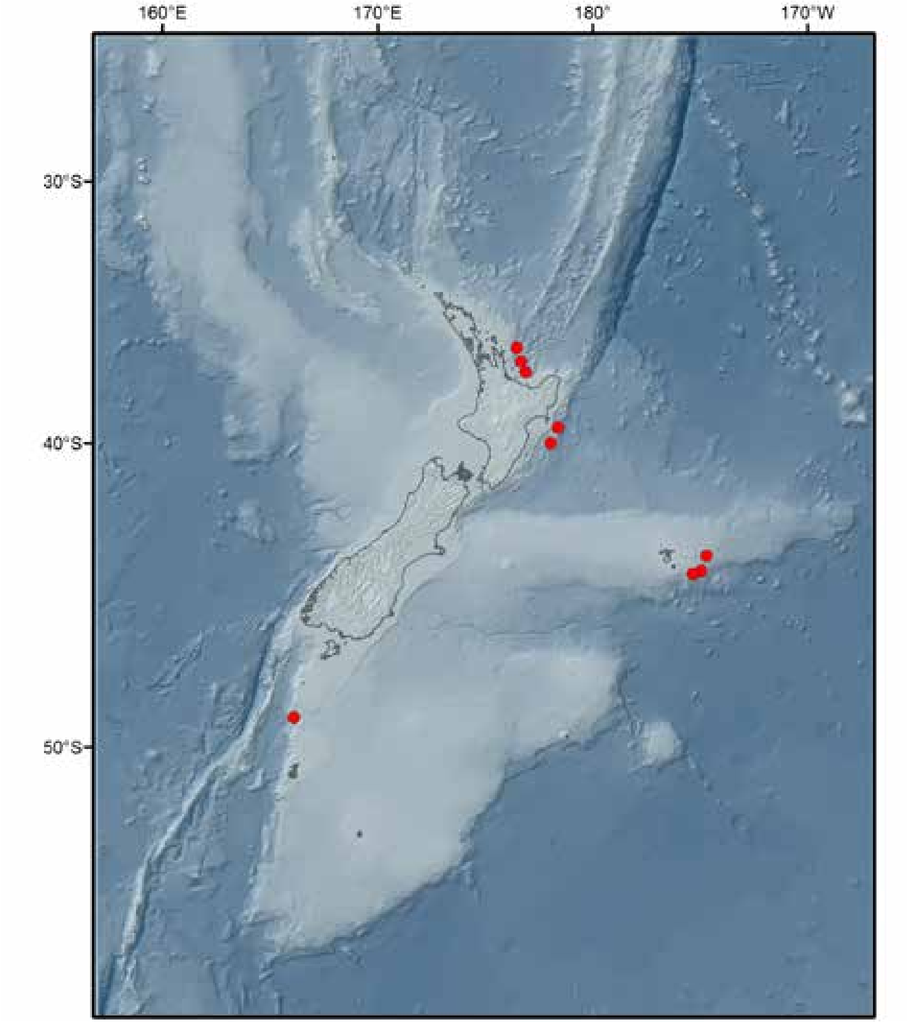
an increased cheliped length and more massive size in male (Baba *et al.* 2011).

In two specimens of *U. torrancei* **sp. nov.** (female cl 6.4 mm NIWA 49472 and male cl 4.7 mm NIWA 49478), the rostrum may have been damaged and regenerated with abnormal shape and spination. A severely deformed telson was also noted in the male from NMNZ CR.015255, probably following injury. The uropods are absent and the telson has regrown in an asymmetrical mitten shape.

One specimen (NIWA 9801) from the Bay of Plenty has less distinct lateral orbital spines and more spinose chelipeds (additional distinct mesial spines on the merus, distodorsal spines on meri and carpi, and less distinct subapical spines on the rostrum), but the locality and meristics align it with *U. torrancei*. This specimen is listed as *U.* cf. *torrancei* **sp. nov.** until further specimens are collected, or molecular examinations can help determine its identity.

According to the key to species of *Uroptychus* (Baba 2018), *U. torrancei* **sp. nov.** is united with other species that share a broadly V-shaped anterior margin of sternite 3, a lateral carapace margin without distinct spines (granules, serrations may be present) and distally convex flexor margins of the P2–4 propodi. This includes *U. hesperius* Ahyong & Poore, 2004, *U. pedanomastigus*, *U. shanei*, *U. senticarpus*, and *U. plumella* (all Baba, 2018). *Uroptychus torrancei* **sp. nov.** can be distinguished from these by the following combination: P2–4 meri without dorsal spines (spines along the meri in *U. hesperius*); a strong lateral orbital spine, subequal in size to the anterolateral spine (rounded lateral orbital angle in *U. hesperius*, distinctly smaller lateral orbital spines in *U. pedanomastigus* and *U. senticarpus*); P2–4 dactyli with obliquely-directed spines and propodi with spines at most along the distal third of flexor margin (perpendicularly directed and spines along the entire margin of the

Figure 193. Distribution of *Uroptychus torrancei* **sp. nov.** around New Zealand.



propodi in *U. pedanomastigus*); antennal scale over-reaching the antennal peduncle, typically ending at the terminal end of the second article of the antennal flagellum (antennal scale that barely reaches or just over-reaches the antennal peduncle in *U. hesperius* and *U. shanei*), an anterolateral spine of the carapace directed straight forward (directed anterolaterally in *U. senticarpus*). Neither of these species are found in New Zealand waters; *U. hesperius* was described from Western Australia, *U. shanei* from Vanuatu, and *U. pedanomastigus* and *U. senticarpus* from Norfolk Ridge (Baba 2018).

In New Zealand, *U. torrancei* **sp. nov.** most closely resembles *U. laperousazi*, Ahyong & Poore, 2004 and *U. plumella* Baba, 2018. Differences between the former are discussed under the species account above. *Uroptychus plumella* has a more northern distribution (Loyalty and Reinga Ridges between New Zealand and New Caledonia) compared to *U. torrancei* **sp. nov.**, which is distributed further south along the eastern margin from the Bay of Plenty to the Chatham Rise. *Uroptychus torrancei* **sp. nov.** is generally a smaller species with cl of 3–7.2 mm (pcl 1.3–4.8 mm) while *U. plumella* has a cl 7.3–8.4 mm (pcl 5.1–6.6 mm). The main distinguishing characteristics between these two species are that *U. torrancei* **sp. nov.** typically has a pair of sub-apical spines of the rostrum (irregular and unarmed in *U. plumella*), but in some instances the rostrum has only a single or more than a pair of spines. The lateral orbital spine is strong, distinctly directed anterolaterally and nearly reaches the tip of the anterolateral spine distally in *U. torrancei* **sp. nov.** (much smaller in *U. plumella*); the carapace lateral margin nearly always has a small spine or granule at the anterior angle of the branchial margin, followed by regular serrations in the posterior portion of the branchial margin (*U. plumella* has a finely and irregularly granulose lateral margin). The cheliped-to-carapace proportions differ between species, with *U. torrancei* **sp. nov.** typically having a distinctly shorter cheliped at 2.7–3.5 × pcl; the largest males may have slightly larger chelipeds (*U. plumella* chelipeds are longer at 2 4.0–4.9 × pcl); and the P2–4 dactyli are longer than the carpi in *U. torrancei* **sp. nov.** and shorter in *U. plumella* (this is most prominent in P2–3 and may not be clear in P4). The spination of the mesial portions of the cheliped meri and carpi varies considerably with sex and size for both species, but these two articles are distally always furnished with a distinct spine in *U. torrancei* **sp. nov.**, while *U. plumella* may only have a small spine on the merus.

Three specimens carry a sacculinid externa under the abdomen (female NIWA 49472, female cl 6.7 mm NIWA 49478, female cl 6.8 mm NMNZ CR.015255).

DNA sequence data. Closest interspecific sequence divergences for partial CO1 gene: the sequence for a male paratype (NIWA 49472) falls within the species cluster containing *U. megistos*, *U. macquariae*, *U. insignis* and *U. longvae* with between 10.5% (*U. insignis*) and 7.7% sequence divergence.

ZooBank registration. *Uroptychus torrancei* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:A90A1C00-6D89-49AF-8A18-16AA2140587F.

Uroptychus tracey Ahyong, Schnabel & Baba, 2015 Figs 194–196

Uroptychus tracey Ahyong, Schnabel & Baba, 2015: 116, figs 5B, 6; Baba 2018: 22 (key).

Material examined. Holotype—NIWA 54266, NIWA Stn TAN0905/119, 44°09.49–09.69′S, 174°33.30–33.14′W, Iceberg Seamount, Andes Seamount Complex, Chatham Rise, 487–616 m, 28 Jun 2009, male (11.3 mm, pcl 7.2 mm).

Other material. *Chatham Rise*, *Veryan Bank*: NIWA 23129, NZOI Stn Q341, 44°07.10′S, 176°19.20′E, 264 m, 14 Nov 1979, 2 females ov. (rostrum broken, 10.1 mm, pcl 7.8, 5.8 mm).

Bay of Plenty, *east-south-east of Mayor Island*: NMNZ CR.023724, NZOI Stn R100, 37°22.0–21.5′S, 176°25.5–31.0′E, 448–388 m, 22 Jan 1979, 1 female ov. (7.0 mm, pcl 3.8 mm), 1 male (8.0 mm, pcl 4.9 mm).

Type locality. Iceberg seamount, Andes Seamount Complex, Chatham Rise, 487–616 m, 28 Jun 2009.

Distribution. Endemic to New Zealand continental shelf and seamounts; Bay of Plenty, Chatham Rise, off Fiordland, Macquarie Ridge, Campbell Rise, 198–758 m (Fig. 196).

Habitat. *Uroptychus tracey* has almost exclusively been sampled from seamounts. Unfortunately, no data exists on possible associations with any other organisms.

Diagnosis. Carapace lateral margin lined with distinct spines behind anterolateral spine; posteriormost branchial spine smaller than preceding spines; numerous small spines and short serrated

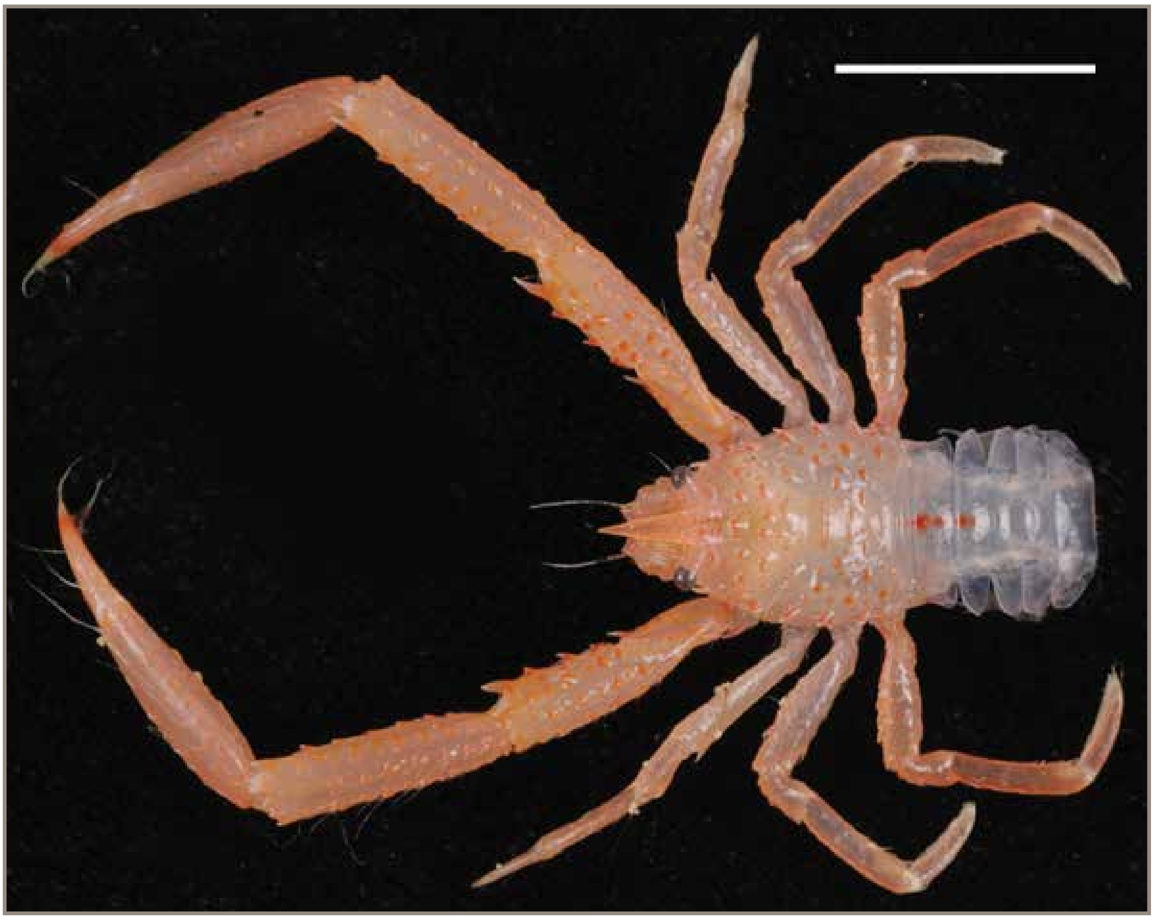


Figure 194. Live coloration of *Uroptychus tracey* Ahyong, Schnabel & Baba 2015, holotype male, NIWA 54266. Scale = 10 mm. Image courtesy of Owen Anderson, NIWA.

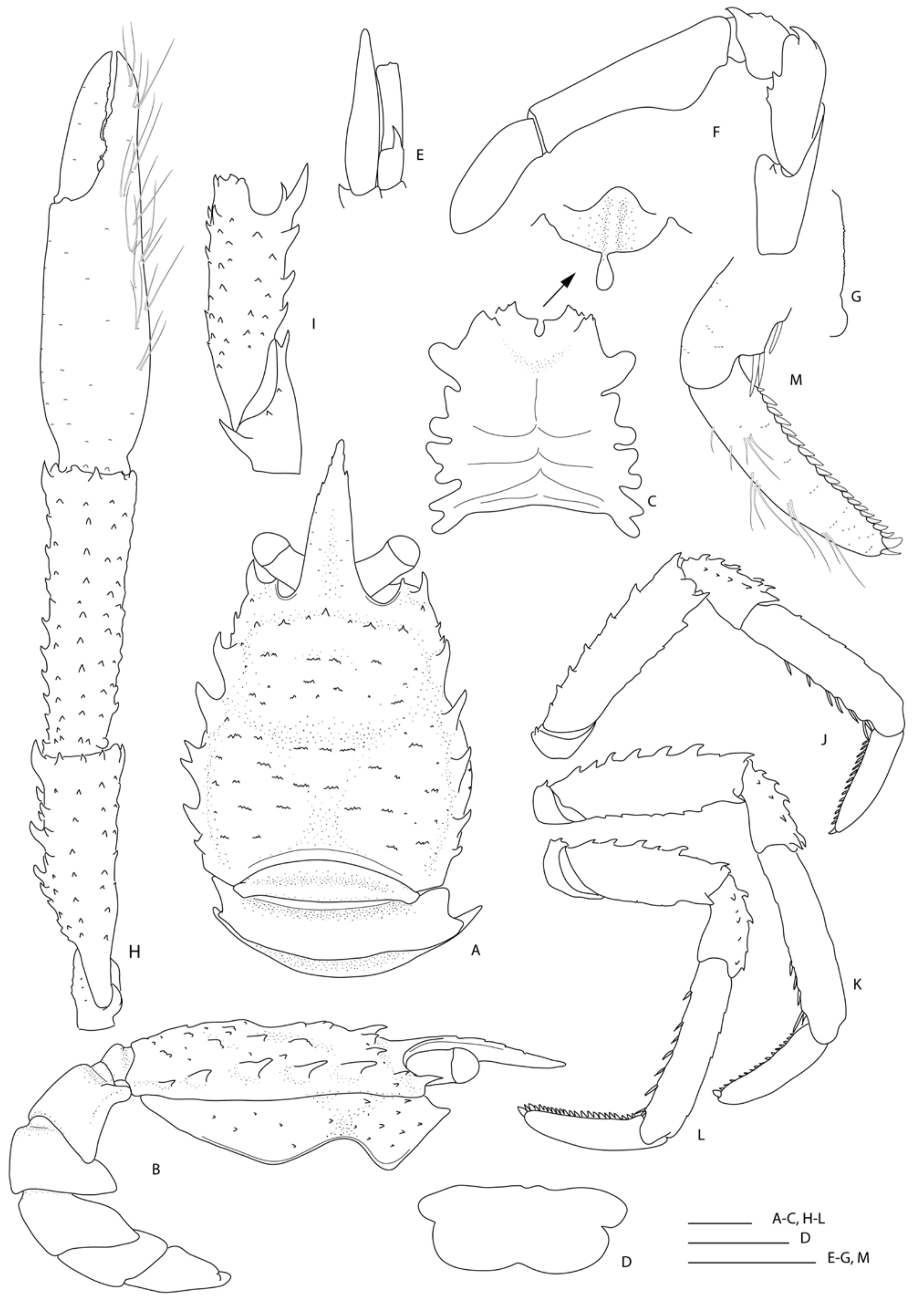


Figure 195. *Uroptychus tracey* Ahyong, Schnabel & Baba 2015, holotype male, NIWA 54266: **A.** carapace and abdomen dorsal; **B.** carapace and abdomen, lateral; **C.** sternal plastron, and inset detail of the excavated sternum; **D.** telson; **E.** antenna, right, ventral; **F.** endopod of Mxp3, left, ventral; **G.** crista dentata of Mxp3, left, lateral; **H.** right cheliped, dorsal; **I.** left cheliped, ischium and merus, lateral; **J–L.** right P2–4. **M.** dactylus and distal portion of propodus of left P4, lateral. Scale bars = 2 mm.

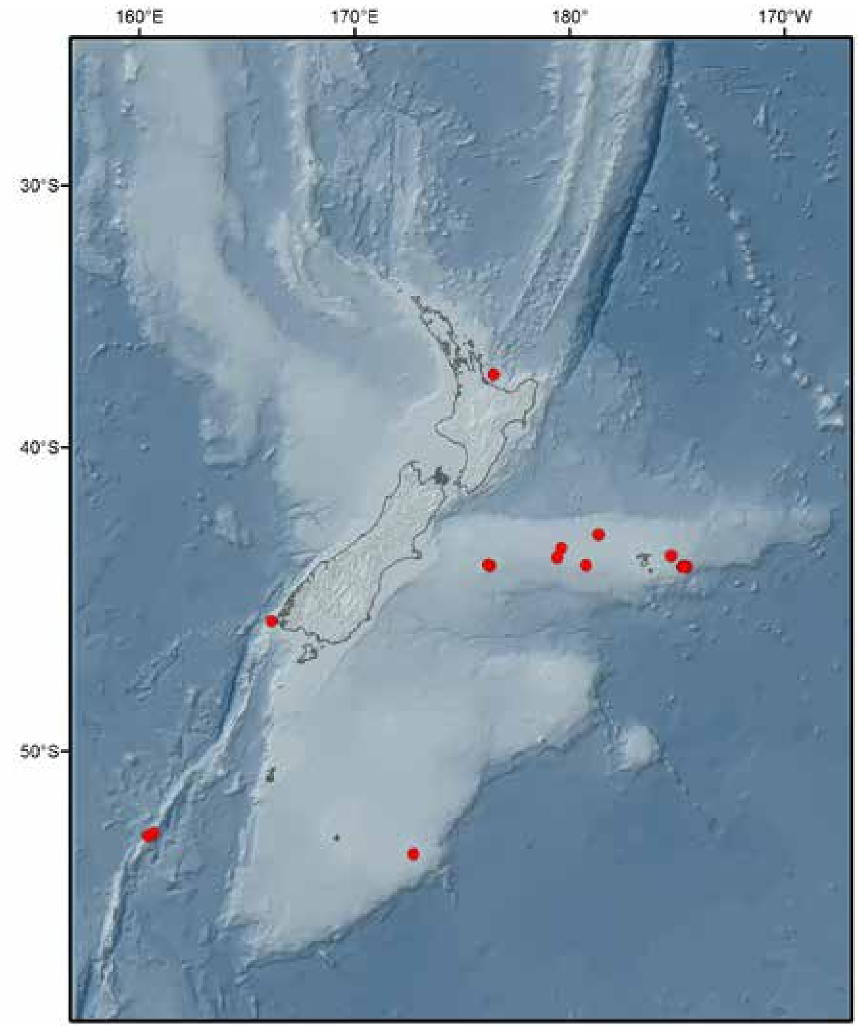


Figure 196. Distribution of *Uroptychus tracey* Ahyong, Schnabel & Baba 2015 around New Zealand.

ridges across entire dorsal surface; epigastric region with distinct row of spines. Rostrum narrow, less than half distance between anterolateral spines at base. Abdomen unarmed. Antennal scale distinctly overreaching peduncle; article 5 unarmed or with small distal spine. Mxp3 ischium with small but distinct spine directly lateral to rounded distal end of flexor margin. P2–4 merus and carpus with spinose extensor margins; propodus with row of movable spines along flexor margin, terminal spines paired. P2–4 dactylus tapering distally, more than half as long as propodus; entire flexor margin lined with obliquely and contiguously arranged spines, penultimate spine prominent.

Colour in life. Carapace, cheliped and walking legs base colour pale orange, abdomen clear. Dark orange details on tips of spines, fingers of cheliped, and in central patches of abdominal tergites 1–3 (Fig. 194).

Remarks. The new specimens of *U. tracey* examined here include the largest known of the species. The ovigerous female (NIWA 23129) is missing the tip of the rostrum but the pcl of 7.8 mm exceeds that of the female holotype (NIWA 54266, pcl 7.2 mm). This may explain the more pronounced overall spination of this large specimen on the carapace dorsal surface, the cheliped and walking legs, which includes lateral spines and granules on the meri, carpi and propodi of the walking legs. The ornamentation of the smaller ovigerous female from the same station more closely resembles that of the holotype (Ahyong *et al.* 2015, Fig. 195). Both specimens have a distinct distal spine on article 5 of the antennal peduncle, which falls within the range of variation noted for the type series as a small to distinct spine (Ahyong *et al.* 2015).

Uroptychus tracey was previously only known from south of the Chatham Rise, so the two specimens from the Bay of Plenty (NMNZ CR.023724) significantly extend the distribution of this species northwards. The specimens clearly match the southern specimens but are notably setose.

Similarities to *U. sexspinosus* Balss, 1913, *U. fusimanus* Alcock & Anderson, 1899 and *U. cardus* are discussed in Ahyong *et al.* (2015). More closely associated in New Zealand, based on the carapace armature and the unarmed abdomen are *U. taratara* **sp. nov.**, *U. taniwha* **sp. nov.**, and *U. paku* Schnabel, 2009. *Uroptychus tracey* differs from all of these in the spination of the P2–4 dactyli (17–21 contiguous spines compared to <12 spines that are loosely spaced). The antennal scale clearly overreaches the peduncle (versus falling short of or reaching the end of the peduncle) and the P2–4 propodi bears numerous spines proximal to the distal pair, which are absent in *U. taniwha* **sp. nov.** and *U. paku*. The other species also typically occur further north (Kermadec and Norfolk Ridge for *U. paku*, Northland and Vanuatu for *U. taratara* **sp. nov.**, while *U. tracey* appears to be a temperate latitude and southern New Zealand continental shelf species. One new record for the Bay of Plenty now overlaps with the only known record for *U. taniwha* **sp. nov.**

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.4% (NIWA 60527, Chatham Rise and AM P97842, Macquarie Ridge). Closest interspecific sequence divergences: 10.8–11.0% (*U. koningen* **sp. nov.**).

Uroptychus vulcanus Baba, 2018 Figs 197, 198

Uroptychus vulcanus Baba, 2018: 558, figs 282, 283.

Type & locality (not examined). Holotype—MNHN-IU-2013-8534, BIOCAL Stn CP109, 22°11′S, 167°16′E, Loyalty Islands, 495–515 m, with gorgonian corals of Primnoidae (Suborder Calcaxonia), 9 Sep 1985, female ov. (pcl 2.0 mm).

Material examined. NIWA 85972, NIRVANA Stn TAN1213/22, 30°4.98′S, 179°49.33′E, Colville Ridge, 483–530 m, 18 Oct 2012, 1 male (3.3 mm, pcl 1.8 mm; sequenced, see Fig. 5).

Distribution. Loyalty Islands, 495–515 m; Colville Ridge, 483–530 m (Fig. 198).

Habitat. The holotype was reported 'with gorgonian corals of Primnoidae' (Baba 2018). Association notes were not recorded for the Colville Ridge specimen (NIWA 85972) but primnoids, plexaurids, and antipatharians were collected at the same station.

Diagnosis. Carapace distinctly broader than long (pcl); dorsal surface with tiny spines and granules in hepatic and lateral branchial region only; lateral orbital spine well-developed but smaller than anterolateral spine; lateral margin with prominent anterior branchial spine and many smaller spines in hepatic and branchial regions. Rostrum narrow (basal width < 0.5 × distance between anterolateral spines). Thoracic sternite 3 with shallow concave anterior margin bearing a tiny median notch. Antennal article 5 slender, as wide as article 4. P2–4 propodi with only pair of terminal spines on flexor margin; dactyli distally narrowed (not truncate); with row of inclined, regularly and closely arranged spines; penultimate spine prominent.

Colour in life. Not known.

Remarks. *Uroptychus vulcanus* was described from a single ovigerous female (pcl 2.0 mm) from the Loyalty Islands collected with primnoid corals between 495–515 m. Slight differences compared to the New Zealand male specimen of similar size are: the rostrum has a few serrations in the proximal portion, being less regularly serrated than the holotype (Baba 2018: fig. 282); the excavated sternum anterior margin is rounded (versus nearly transverse); the sternal plastron is slightly narrower (1.2 versus 1.4 × broader than long); and the anterolateral margin of sternite 3 is round (versus not angular, and furnished with two small terminal spines); the chelipeds of the male examined here are both 6.0 × pcl (compared to 5.0 × pcl) (Fig. 197). This lies within the expected range of sexual dimorphism, which could also be said for the stouter and wider palms which are ~3.3 × as long as wide (versus 3.9 ×) and 0.8 × as long as the carpus (versus 0.9 ×).

Uroptychus vulcanus is a distinctive species, most similar to *U. pars* **sp. nov.**; see comments under that species above.

DNA sequence data. Closest interspecific sequence divergences for partial CO1 gene: 14.7% (*U. pars* **sp. nov.**), 14.6–14.8% (*U. ihu* **sp. nov.**).

Uroptychus webberi Schnabel, 2009 Figs 199, 200

Uroptychus webberi Schnabel, 2009a: 572, figs 7, 17; Schnabel 2009b: 31 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 210 (list); Baba 2018: 24 (key).

Material examined. Holotype—NMNZ CR.012097, NZOI Stn K846, 30°13.09′S, 178°31.99′W, Macauley Island, Kermadec Ridge, 610–640 m, 29 Jul 1974, female ov. (10.7 mm, pcl 9.0 mm).

Type locality. Macauley Island, Kermadec Islands, Kermadec Ridge, 610–640 m.

Distribution. Only known from the type locality (Fig. 200).

Habitat. Unknown.

Diagnosis. Carapace about as long as broad; branchial lateral margins parallel, with wide and distinct ridge on posterior third, anterolateral spine stout; dorsal surface smooth, unarmed. Rostrum short and narrow (width < 0.5 × distance between anterolateral spines). Sternite 3 with pair of submedian spines and strong anterolateral spines on each side. Sternite 4 with anterolateral process not reaching anterior end of sternite 3, surface smooth except for tuberculate transverse ridge. Antennal articles 4 and 5

Figure 197. *Uroptychus vulcanus* Baba, 2018, male, NIWA 85972: **A.** carapace and abdomen dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson, setae omitted; **E.** antenna, left, ventral; **F.** endopod of Mxp3, left, lateral; **G.** crista dentata, right; **H.** left cheliped, dorsal; **I.** left cheliped, ischiomerus, mesial; **J–L.** right P2–4; **M.** dactylus and distal portion of propodus of right pereopod 3, lateral. Scale bars = 2 mm.

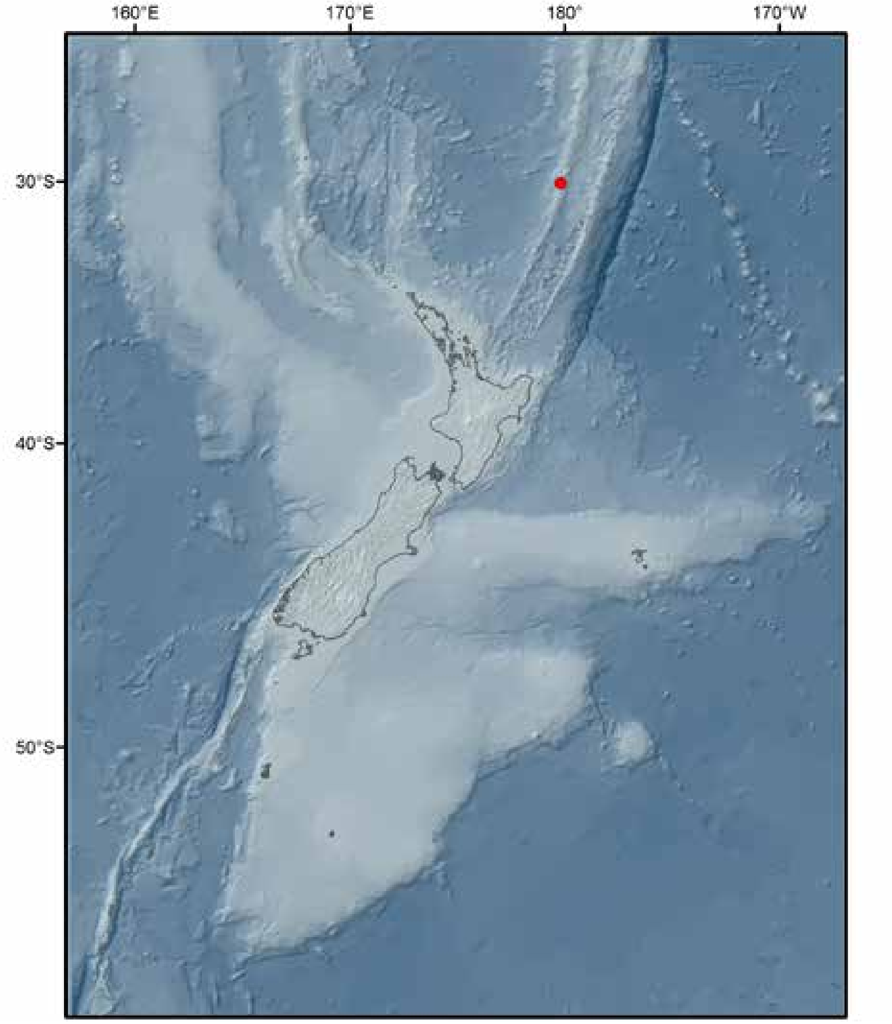


Figure 198. Distribution of *Uroptychus vulcanus* Baba, 2018 around New Zealand.

unarmed; antennal scale nearly twice as wide as article 4, reaching midlength of article 5, rounded. Cheliped ischium with stout distodorsal and one distoventral spine followed by row of granules. Pereopods 2–4 meri and carpi smooth along dorsal margins; propodi flexor margin straight, with 6–10 spines along distal 0.5–0.6 length, distal paired and close to juncture with dactyli; dactyli distally narrowed, with regularly arranged spines all relatively short, directed contiguously to margin; ultimate slender, longer than and slightly wider than remaining spines on flexor margin.

Colour in life. Not known.

Remarks. No further specimens of *U. webberi* have been sighted since it was first described (Schnabel 2009a), so the species remains known only from the ovigerous female holotype collected in just over 600 m depth off Macauley Island in 1974. Figure 199C adds an illustration of the excavated sternum and a more detailed drawing of the dactylar spination of pereopod 3 (Fig. 199M). The excavated sternum of the holotype is anteriorly acute, only slightly ridged along the midline with a minute tubercle situated at mid-length.

The distal-most spine on the P2–4 dactyli of *U. webberi* is slightly wider than the preceding spines, the penultimate spine at its base is subequal in width to the remaining spines. The spines along the flexor margin of *U. webberi* are all stout and rounded, as if well worn and they look very similar to the dactylar morphology of *U. brevisquamatus*, which, however, is easily distinguished from *U. webberi* by the fact of a single distal spine (versus a pair of spine) on the P2–4 propodus flexor margin.

Based on the general dactylar spination with spines arranged parallel to the flexor margin, *U. webberi* is allied with *U. australis* (Henderson, 1885), *U. brevisquamatus* Baba, 1988, and *U. disangulatus* Baba, 2018, but these species clearly differ in the shape of the carapace, e.g. the lateral branchial margins are convexly divergent in all others instead of being subparallel as in *U. webberi*. More detailed comparisons are provided under the accounts of the species above.

Figure 199. *Uroptychus webberi* Schnabel, 2009, holotype female ov., NMNZ CR.012097: **A.** carapace and abdomen dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron; **D.** telson; **E.** antenna, left, ventral; **F.** endopod of Mxp3, left, lateral. **G,** crista dentata, right; **H.** right cheliped, dorsal; **I.** right cheliped, ischium and merus, lateral; **J–L.** right P2–4; **M.** dactylus and distal portion of propodus of right pereopod 3, lateral. Scale bars = 2 mm. After Schnabel (2009).

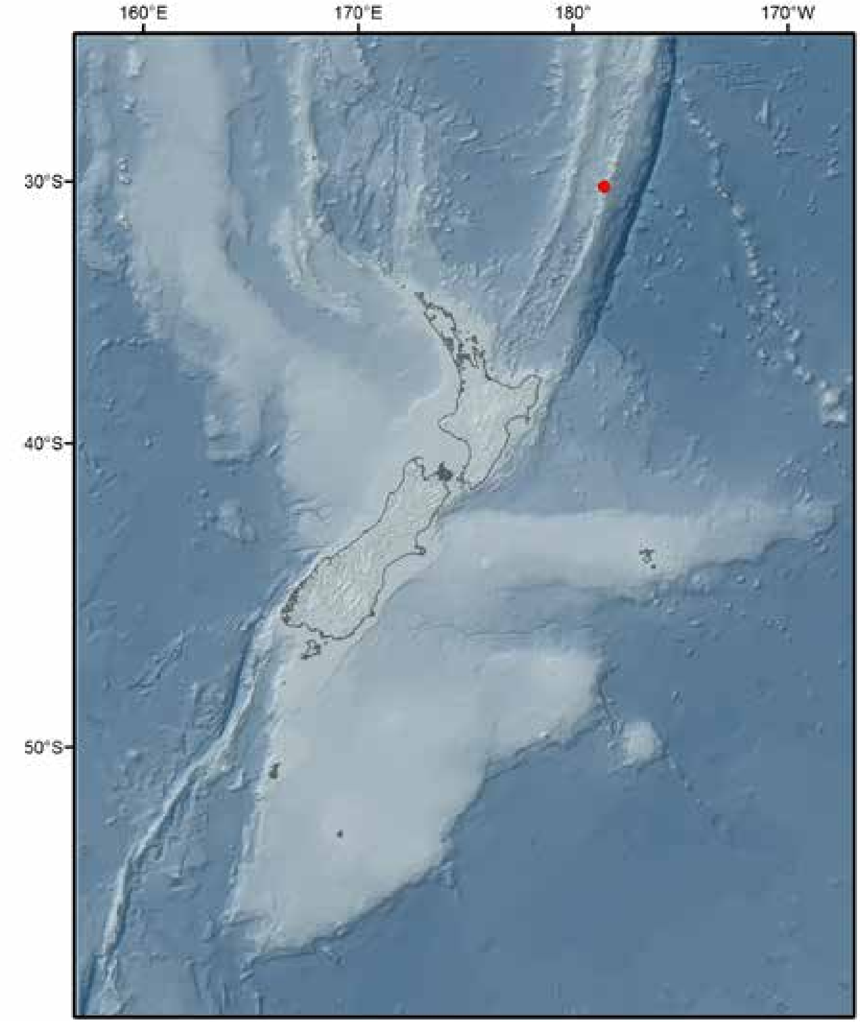


Figure 200. Distribution of *Uroptychus webberi* Schnabel, 2009 around New Zealand.

Uroptychus yaldwyni Schnabel, 2009

Figs 201, 202

Uroptychus yaldwyni Schnabel, 2009a: 575, figs 7, 18; Schnabel 2009b: 32 (list); Rowden *et al.* 2010: 75 (list); Webber *et al.* 2010: 225 (list); Yaldwyn & Webber 2011: 210 (list); Baba 2018: 25 (key).

Material examined. Holotype—NMNZ CR.012098, NZOI Stn K840, 30°17.59′S, 178°25.30′W, Macaulay Island, Kermadec Islands, Kermadec Ridge, 398–412 m, 28 Jul 1974, female ov. (4.2 mm, pcl 2.9 mm).

Type locality. Macaulay Island, Kermadec Islands, Kermadec Ridge, 398–412 m.

Distribution. Known only from the type locality (Fig. 202).

Habitat. There is no information on biological associations for *U. yaldwyni*, but the station records include a wide range of corals including primnoids, plexaurids, scleractinians, and antipatharians. Both of the most similar species discussed below, *U. poorei* Baba, 2018 and *U. amabilis* Baba, 1979, were collected with soft corals; the description of *U. poorei* included a record of a specimen with *Chironephthya* sp. Studer (& Wright), 1887, and the holotype of *U. amabilis* was found among a *Siphonogorgia variabilis* (Hickson, 1903). It is likely that *U. yaldwyni* shows similar associations.

Diagnosis. Carapace with strong anterolateral spine larger than lateral orbital spine; lateral margin widening posteriorly, with 7 or 8 spines: 1 anterior branchial; 6 or 7 posterior branchial; lateral hepatic margin unarmed; dorsal surface unarmed, anterior cardiac region slightly inflated. Rostrum narrow triangular (width < 0.5 × distance between anterolateral spines at base). Sternal plastron slightly wider than long; sternite 3 anterolaterally produced to acute angular point, anterior margin with U-shaped median notch flanked by pair of submedian spines. Mxp3 unarmed. Cheliped ischium with distodorsal spine only. Pereopods 2–4 meri and carpi smooth along dorsal margin; propodi with pair of distal spines only; dactyli distally narrowed, with 6 strong spines perpendicularly and loosely arranged along flexor margin, penultimate spine largest, approximately twice as wide as ultimate, about 1.5 × wider than antepenultimate.

Colour in life. Unknown.

Remarks. *Uroptychus yaldwyni*, collected around the Kermadec Islands during the 1974 *Challenger*

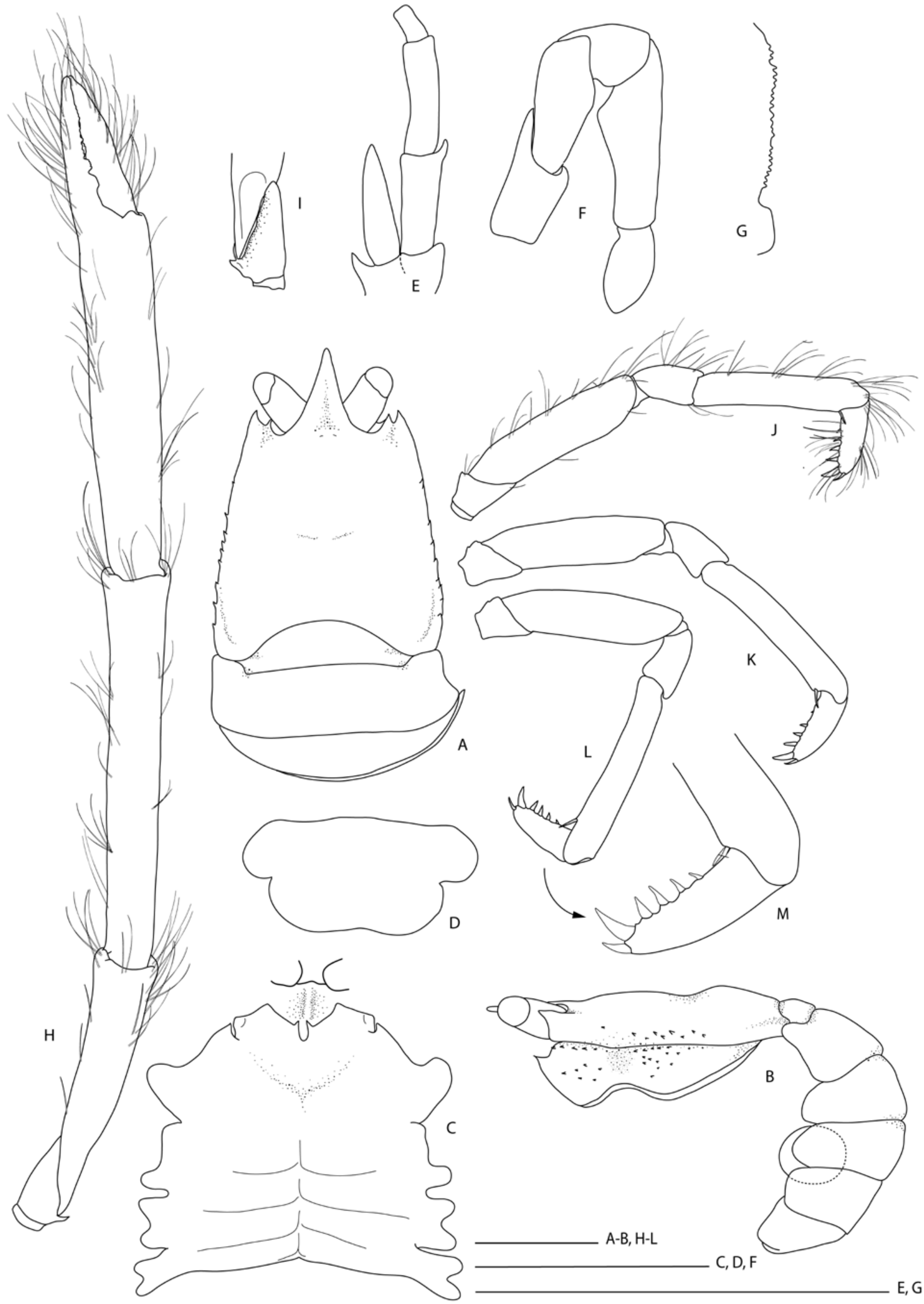


Figure 201. *Uroptychus yaldwyni* Schnabel, 2009, holotype female ov., NMNZ CR.012098: **A.** carapace and abdomen dorsal; **B.** carapace and abdomen, lateral; **C.** excavated sternum and sternal plastron showing coxa of Mxp1; **D.** telson; **E.** antenna, left, ventral; **F.** endopod of Mxp3, right, lateral; **G.** crista dentata, right; **H.** left cheliped, dorsal; **I.** left cheliped, mesial; **J–L.** right P2–4; **M.** dactylus and proximal portion of propodus of P4. Scale bars = 2 mm. Modified after Schnabel (2009).

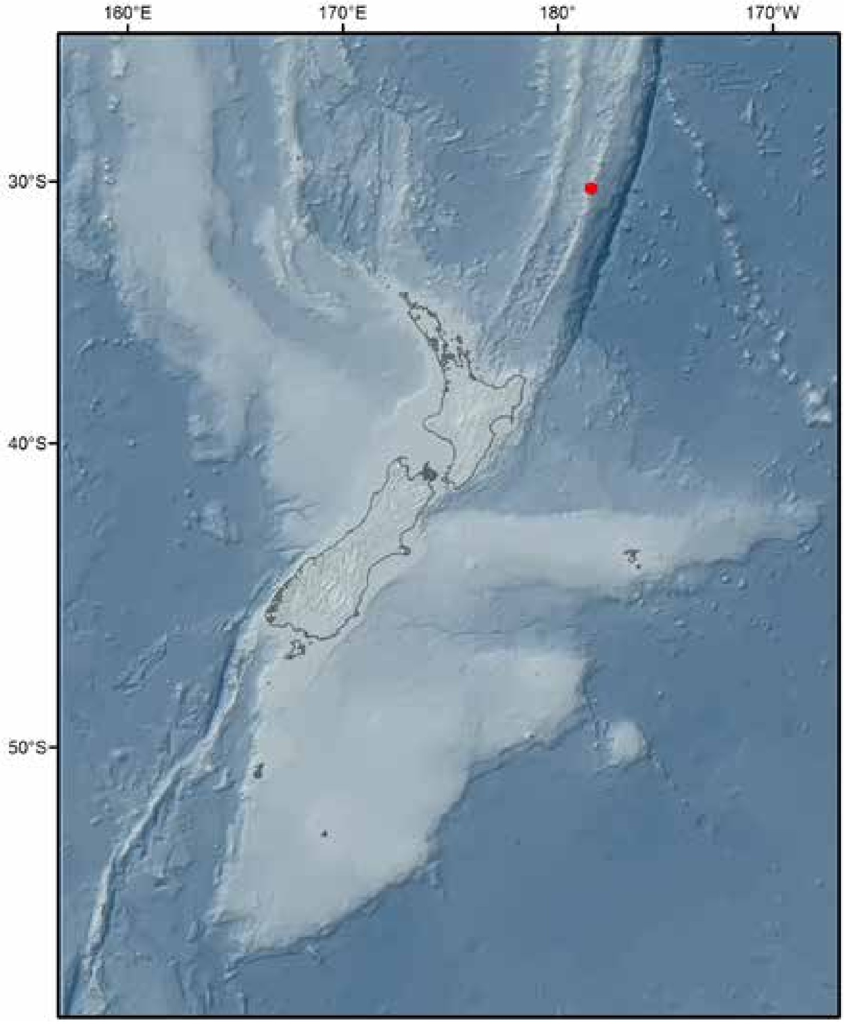


Figure 202. Distribution of *Uroptychus yaldwyni* Schnabel, 2009 around New Zealand.

Centenary Cruise remains the sole specimen for the species (as is the case for *U. kaitara* and *U. webberi*, which were collected during the same cruise). The combination of a small size, posteriorly divergent lateral carapace margins with a strong anterolateral spine (exceeding the lateral orbital spine) and small lateral branchial spines, short antennal scale, shape of the sternal plastron and the loosely arranged perpendicular spines on the P2–4 dactyli distinguishes this species (Fig. 201). In appearance, other than the carapace shape, it is similar to the other Kermadec species *U. rutua* and *U. toka* and *U. helenae* **sp. nov.** However, the anterolateral spine is larger than the lateral orbital spine, and the carapace is progressively widening posteriorly in *U. yaldwyni*. In contrast, the lateral orbital spine is at least subequal in size to the anterolateral spine and the lateral carapace margin is convexly divergent in the other species. The surface of the carapace is also smooth in *U. yaldwyni,* while it is furnished with small spines or denticles across the gastric regions in all the others.

With regards to size and carapace shape, it is similar to *U. amabilis* Baba, 1979 from New Caledonia and *U. poorei* Baba, 2018 from the Norfolk Ridge, but these differ from *U. yaldwyni* in having a smooth lateral carapace margin (bearing small branchial spines in *U. yaldwyni*), in having a longer antennal scale that reaches the midlength of the article 5 (*U. poorei*) or nearly reaches the end of that article in *U. amabilis* (it slightly overreaching the end of article 4 in *U. yaldwyni*), and in having a smooth pterygostomian flap (covered with small tubercles in *U. yaldwyni*). *Uroptychus amabilis* also has a distinct distal spine on the antennal article 5, which is absent in both *U. yaldwyni* and *U. poorei*.

Uroptychus yokoyai Ahyong & Poore, 2004

Figs 203, 204

Uroptychus yokoyai Ahyong & Poore, 2004: 79, fig. 25; Baba 2005: 232 (synonymies, key); Baba *et al.* 2008: 45 (list and synonymies); Poore *et al.* 2011: 330, pl. 8E; Baba 2018: 561, figs 284, 306H.

Type & locality (not examined). Holotype—AM P65827, FR0589-39, 26°44.27′S, 159°28.93′E, Gifford Guyot, E. of Brisbane, Tasman Sea, Australia, 306 m, 1 male (cl 4.0 mm), on *Subergorgia* coral.

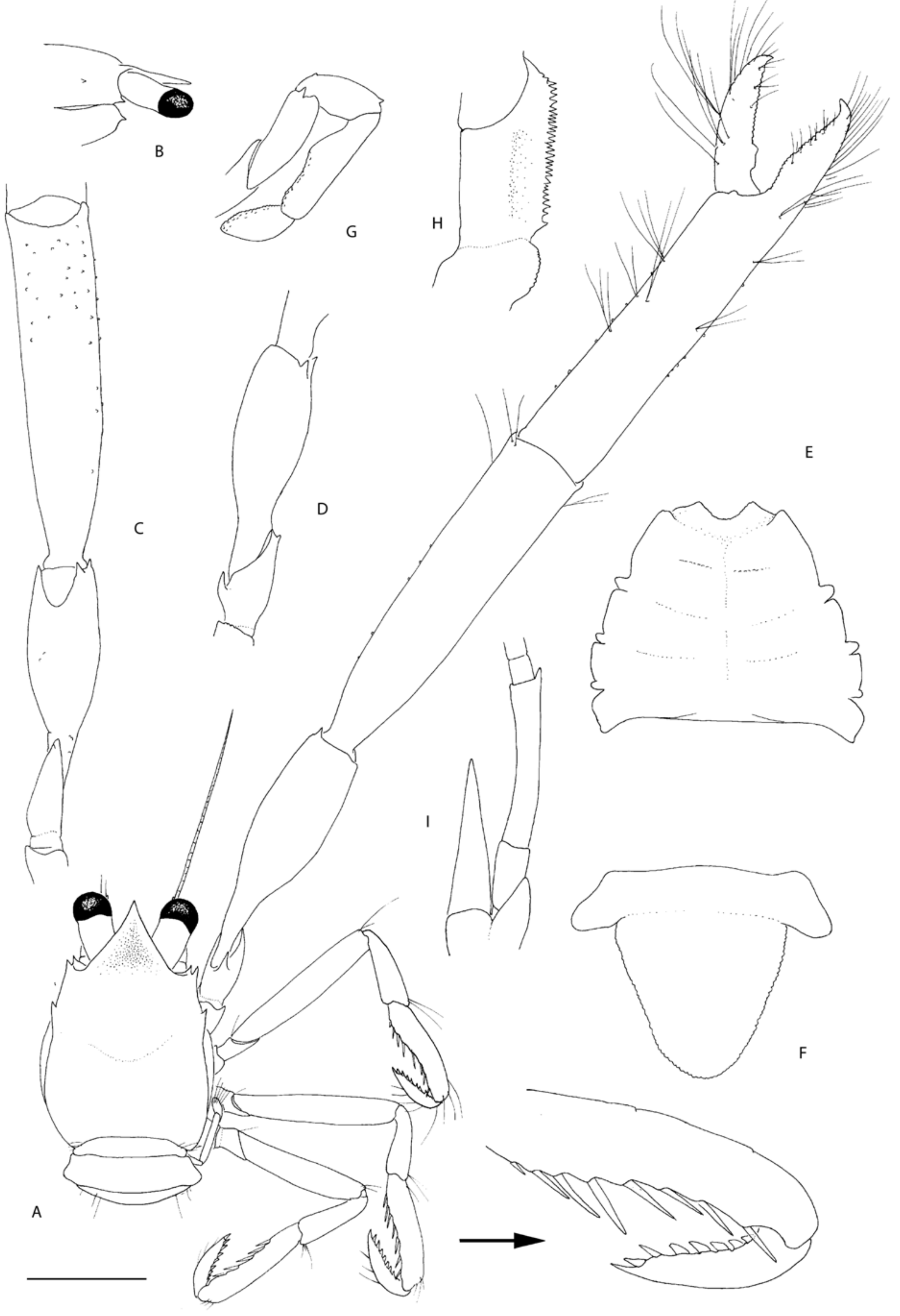


Figure 203. *Uroptychus yokoyai* Ahyong & Poore, 2004, holotype male, AM P65827: **A.** dorsal habitus; **B.** anterior carapace, right lateral; **C.** cheliped, right ventral; **D.** cheliped, proximal right lateral; **E.** sternal plastron; **F.** telson; **G.** Mxp3, right lateral; **H.** crista dentata, right; **I.** antenna, right ventral. Scale A–D = 2 mm; E, G = 1 mm; F, H–I = 0.5 mm. After Ahyong & Poore (2004).

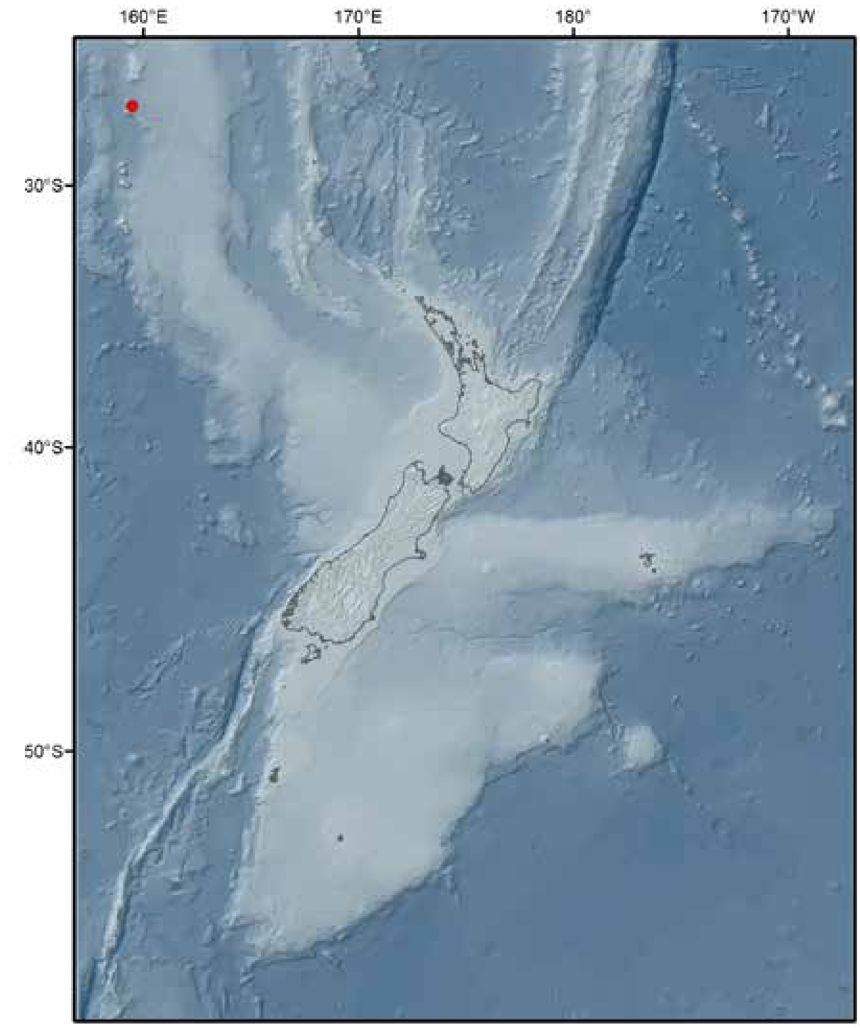


Figure 204. Distribution of *Uroptychus yokoyai* Ahyong & Poore, 2004 around New Zealand.

Distribution. Tasman Sea (Fig. 204), Philippines, Vanuatu, New Caledonia, south of the Chesterfield Islands, Norfolk Ridge, the Hunter-Matthew Islands, and Tonga, 105–573 m.

Habitat. *Uroptychus yokoyai* was originally described from a subergorgiid gorgonian coral. Baba (2018) reported many collections of *U. yokoyai* with chrysogorgiid gold corals.

Diagnosis. Carapace excluding rostrum slightly broader than long; broadest at about midlength; dorsal surface unarmed; lateral margins convex, with anterolateral spine and one prominent spine at base of indistinct cervical groove; lateral orbital angle produced to distinct spine. Rostrum slightly broader than long. Thoracic sternite 3 anterior margin shallow concave without submedian spines, anterolateral angle obtuse. Eyestalks extending slightly beyond rostrum. Antennal article 2 unarmed; article 4 unarmed; article 5 with distal spine; antennal scale extending beyond midlength but not beyond apex of article 5. Cheliped propodus, carpus and distal portion of merus with granular ventral surfaces; merus proximally narrowed, 'bowling pin' shaped (Fig. 203 A, C, D). Pereopods 2–4 similar; propodi not broadened distally, flexor margin with 6–8 movable spines along nearly entire length; dactyli with 8 or 9, obliquely directed spines on flexor margin, distal 3 slender and subequal, proximal spines relatively broad.

Colour in life. Base colour pale pink, nearly transparent, cephalothorax and abdomen more pinkish along midline, abdominal pleura translucent (Poore *et al.* 2011).

Remarks. The type series of *U. yokoyai* was collected from Gifford Guyot, north of Lord Howe Island (Ahyong & Poore 2004) and while this lies within Australian territorial waters, the guyot is in the New Zealand region as defined here (Fig. 204). No new material from the New Zealand region has been sighted, but Baba (2018) provided new records from a range of locations around the Philippines, Vanuatu, New Caledonia, Tonga, Loyalty Ridge and Norfolk Ridge. *Uroptychus yokoyai* is a primarily tropical species.

Uroptychus yokoyai is most similar to *U. alcocki* Ahyong & Poore, 2004 (see a discussion of distinguishing characteristics under the latter species above).

Family **Eumunididae** A. Milne-Edwards & Bouvier, 1900

Eumunidiens A. Milne-Edwards & Bouvier, 1894: 299, 308, 312; Bouvier 1896: 312; A. Milne-Edwards & Bouvier 1897: 8, 116 [vernacular name, unavailable].
Eumunidae A. Milne-Edwards & Bouvier, 1900: 364.
Eumunididae, Schnabel & Ahyong, 2010: 58, figs 1, 2A, B, G, H; Macpherson & Baba 2011: 50.

Diagnosis. Carapace with transverse setiferous striae. Rostrum spiniform, usually flanked by two supraocular spines. Abdominal somite 2 with pleural margin anterolaterally produced into strong spine. Tailfan folded beneath preceding abdominal somite, telson transversely divided into 2 lobes. Antennal scale present. Mandible incisor ridge with 3 small teeth. Mxp 1 with well-developed epipod. Mxp3 to P4 (vestigial on Mxp3) with 2 arthrobranchs, P5 with 1 arthrobranch; P2–4 with pleurobranch. G1 absent, G2 vestigial or absent (Macpherson & Baba 2011).

Remarks. The family Eumunididae A. Milne-Edwards & Bouvier, 1900 was recognised by Schnabel & Ahyong (2010) for two genera formerly placed in Chirostylidae, based on molecular, somatic, sperm and larval evidence. This corroborated the early separation of chirostyloids into the two informal groups 'Eumunidiens' for *Eumunida* and 'Diptyciens', which contained *Ptychogaster* (now *Gastroptychus* and *Sternostylus*) and *Diptychus* (now *Uroptychus*) (A. Milne- Edwards & Bouvier 1894, 1900). The family contains two genera: *Pseudomunida* and *Eumunida*. *Eumunida* was divided into two subgenera (*Eumunida* and *Eumunidopsis*) by de Saint Laurent & Poupin (1996).

Type genus. *Eumunida* Smith, 1883, by monotypy.

Key to genera of Eumunididae

1. Lateral and mesial supraocular spines well developed. Oblique row of hepatic spines present .... ***Eumunida*** Smith, 1883
– Lateral supraocular spine very small or barely discernible. Oblique row of hepatic spines absent .... ***Pseudomunida*** Haig, 1979

Genus ***Eumunida*** Smith, 1883

Eumunida Smith, 1883: 44; Henderson 1888: 168; A. Milne-Edwards & Bouvier 1894: 308; Gordon 1930: 741; de Saint Laurent & Macpherson 1990a: 229; de Saint Laurent & Poupin 1996: 347; Poore 2004: 220; Baba 2005: 17; Baba *et al.* 2008: 15; Baba *et al.* 2009: 11; Macpherson & Baba 2011: 50.
Eumunida (*Eumunida*) de Saint Laurent & Poupin, 1996: 347.
Eumunida (*Eumunidopsis*) de Saint Laurent & Poupin, 1996: 365 (type species: *Eumunida capillata* de Saint Laurent & Macpherson, 1990a, original designation). *Eumunida* "group B", Gordon, 1930: 742.

Diagnosis. Carapace with oblique, posteriorly diverging row of three spines on hepato-gastric border; transverse striae usually distinct, rarely obsolete. Rostrum spiniform. Two well-developed supraocular spines. Sternal plastron with two submedian processes or spines on anterior margin. Pleuron of abdominal segment 2 produced into spine. G1 absent, G2 reduced to small size or absent. Antennal peduncles with distal spine on each of articles 2–5, antennal scale spiniform. Mxps 1, as well as Mxps 2 close to each other. Cheliped carpus with 2 or 3 terminal spines, palm often with setal pad of velvet-like setae. P2–4 meri armed with row of spines on dorsal crest, continued on to carpus (Macpherson & Baba 2011).

Remarks. *Eumunida* contains 33 species, with the majority (27 species) from the Indo-West Pacific, one from the eastern Pacific, and three species from the Atlantic. Three species, *E. annulosa* de Saint Laurent & Macpherson, 1990a, *E. australis* de Saint Laurent & Macpherson, 1990a, and *E. pacifica* Gordon, 1930, have previously been reported from New Zealand (Schnabel 2009b, Yaldwyn & Webber 2011, Webber *et al.* 2010). *Eumunida australis* was described from a single specimen collected in 1907 from the 'Tasman Sea'. The type locality actually lies within the New Zealand region on the western flank of the Challenger Plateau. The remaining two species previously reported from New Zealand were revealed as errors: *E. annulosa* reported in Schnabel (2009b) was based on a transcription error from the southern New Caledonia type series (de Saint Laurent & Macpherson 1990a), and *E. pacifica* reported in Webber *et al.* (2010) was based on a specimen collected in the Solomon Islands. These two species are here removed from the New Zealand faunal list.

Three additional species of *Eumunida* are now reported for the first time from New Zealand: *E. spinosa*

Macpherson, 2006, *E. sternomaculata* de Saint Laurent & Macpherson, 1990a, and one species *Eumunida* sp. of which the systematic status is yet to be fixed.

The identification of species of *Eumunida* is particularly challenging, with few diagnostic characters available. The identification of these species was therefore confirmed using molecular diagnostics where possible. Puillandre *et al.* (2011) published DNA barcoding sequences for two-thirds of the known species of *Eumunida*, including type specimens of 13 species. This CO1 reference library allowed for the verification of identifications with high confidence. Unfortunately, this does not include a sequence of *E. australis*.

A key provided by De Saint Laurent & Poupin (1996) to the Indo-West Pacific *Eumunida* remains the key reference. It divides the species into two subgenera, *E.* (*Eumunida*) and *E.* (*Eumunidopsis*) based on the presence or absence of a pair of well-developed, symmetrical spines on the anterior margin of thoracic sternite 4. However, the key and the diagnoses prove problematic, see remarks under the species below.

Type species. *Eumunida picta* Smith, 1883 (by monotypy).

Key to species of *Eumunida* of New Zealand

1. Ventral pad on cheliped palm absent. Lateral and dorsal row of spines on cheliped carpus ....***Eumunida spinosa*** Macpherson, 2006
– Ventral pad on cheliped palm always present. Lateral and dorsal row of spines on cheliped absent or indistinct 2
2. Rostral base long, first anterolateral spine at most reaching hiatus between supraocular spines .... ***Eumunida sternomaculata*** de Saint Laurent & Macpherson, 1990a
– Rostral base short, first anterolateral spine reaching midlength of lateral supraocular spine ....***Eumunida australis*** de Saint Laurent & Macpherson, 1990a

Eumunida australis de Saint Laurent & Macpherson, 1990a — Figs 205, 206

Eumunida picta, Gordon, 1930: 742 (part), fig. 1b.
Eumunida sp., de Saint Laurent & Macpherson 1990b: 249, figs 6c, d.
Eumunida australis de Saint Laurent & Macpherson, 1990a: 664, figs 2d, 4d, 5d, 6d, 8d, 8h, 10d, 11; Poore 2004: 221, fig. 60a (compilation); Baba 2005: 209 (synonymies); Baba *et al.* 2008: 15 (list and synonymies).
Eumunida (*Eumunida*) *australis*, de Saint Laurent & Poupin 1996: 364; Davie 2002: 30 (no record); Ahyong & Poore 2004: 5; Schnabel 2009b: 24 (list); Yaldwyn & Webber 2011: 210 (list).

Type & locality (not examined). Holotype—NHMUK 1907.16.10, 38°13′S, 168°42.5′E, Challenger Plateau, Tasman Sea, International Waters, 685 m, 1 male (25.5 mm, pcl 17 mm).

Material examined. AM P31514, StnStn K80-12-01, NE of Wollongong, 34°21′S, 151°25′E, 463 m, female (16.1 mm).

Distribution. Eastern Tasman Sea (Fig. 206) to Australia (southeast Queensland, New South Wales), 300–685 m.

Habitat. Unknown.

Diagnosis. Carapace with at least 4, more-or-less complete, transverse, piliferous, striae on the posterior region. Lateral margin with two anterolateral spines in front of cervical groove; first anterolateral spine long, at least two-thirds length of lateral supraocular spine; clearly overreaching level of hiatus between supraocular spines. Distinct pair of spines on anterior margin of thoracic sternite 4 present. Cheliped merus with 5–8 ventral spines; carpus with 3 distal spines, dorsal surface rugose but unarmed, mesial surface with small spines; palm with setal pad and 2 mesial rows of small spines.

Colour in life. Unknown.

Remarks. *Eumunida australis* was originally described by de Saint Laurent & Macpherson (1990a) from a single male specimen (pcl 17 mm) from the British Museum Collection (NHMUK 1907.16.10, Fig. 205A). The type locality is situated within the New Zealand region on the western flank of the Challenger Plateau in 685 m of water. De Saint Laurent & Poupin (1996) provided a further record of a larger male (pcl 24.5 mm) from SE Queensland (590 m) and Ahyong & Poore (2004) report both a small male (cl 10.8 mm) and female (cl 16.1 mm) from New South Wales (300–463 m). A sketch of the larger female (AM P31514) was kindly provided by Shane Ahyong (AM) and is reproduced here (Fig. 205).

The holotype of *E. australis* remains the only specimen currently known from the New Zealand region. Most of the large specimens in the NIWA and NMNZ collections were originally identified as *E. australis*, but these have been referred herein to *E.* cf. *sternomaculata* based on the characters discussed

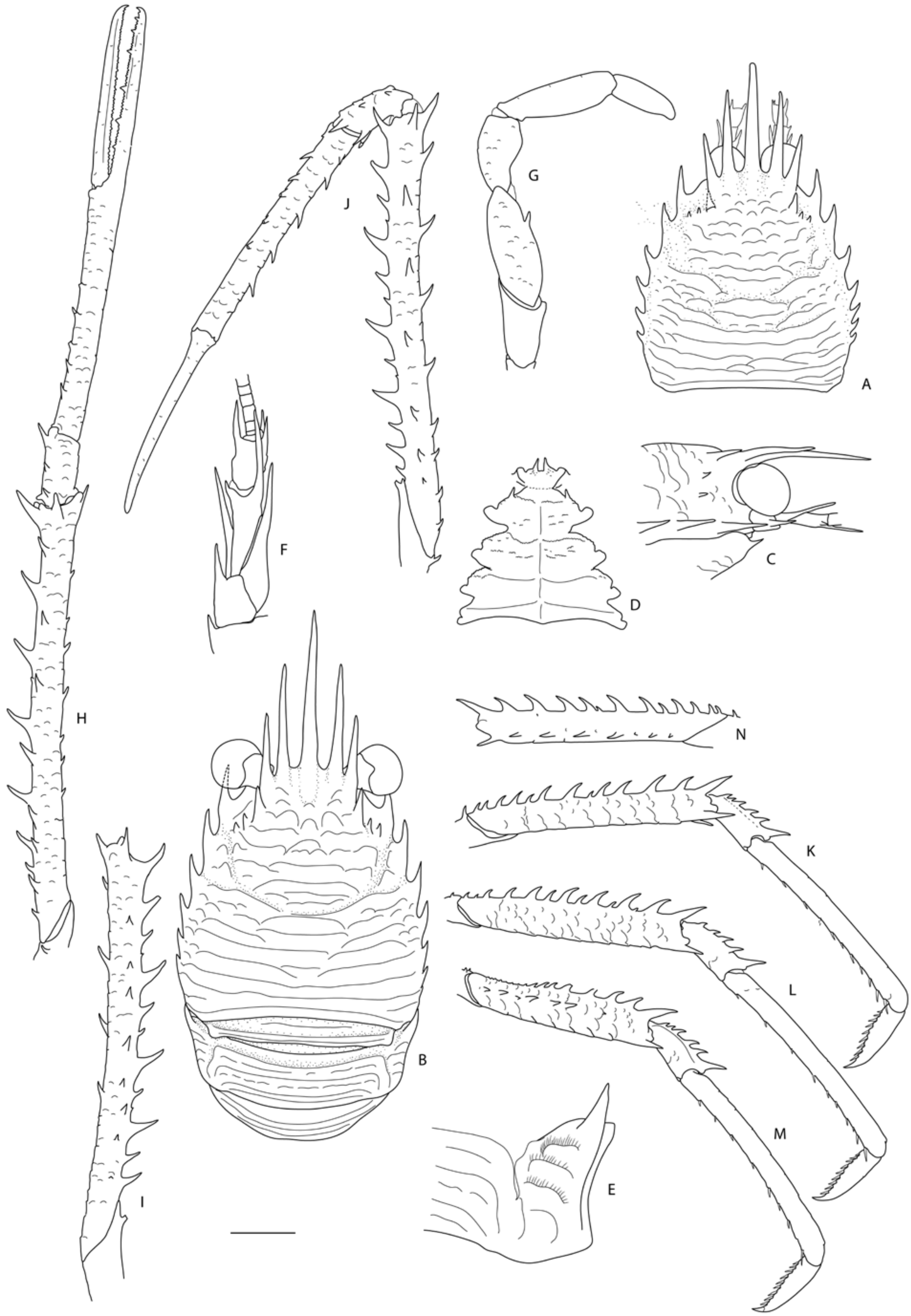
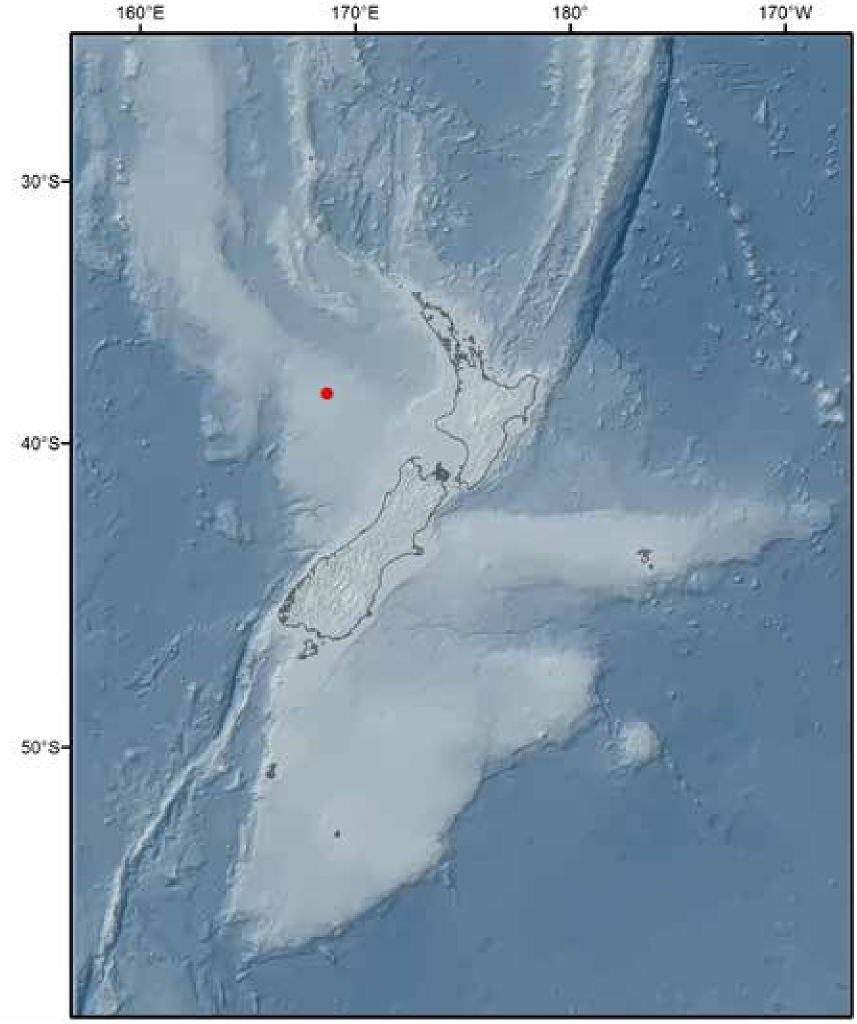


Figure 205. *Eumunida australis* de Saint Laurent & Macpherson, 1990. A. male holotype, pcl 17 mm, NHMUK 1907.7.16.10; B–N. female, cl 16.1 mm, AM P31514: **A.** dorsal carapace (after de Saint Laurent & Macpherson (1990a)); **B.** carapace and abdomen, dorsal; **C.** anterior portion of carapace and pterygostomian flap, right, lateral; **D.** sternal plastron; **E.** abdominal somite 2, right lateral; **F.** right antennal peduncle, ventral; **G.** ischium and merus of right Mxp3, lateral; **H.** right cheliped, dorsal; **I.** right cheliped ischium and merus, lateral; **J.** right cheliped distal palm and fingers, mesial; **K–M.** P2–4, lateral; **N.** P2, merus, mesial. Scale B–D, H–N= 5 mm; E–G = 10 mm. Line drawings for B–N courtesy of Shane Ahyong (AM).

Figure 206. Type record of *Eumunida australis* de Saint Laurent & Macpherson, 1990.



below under *E. sternomaculata*. It is clear that the morphological characters that are currently used may not be sufficient to distinguish these species reliably, and a review of the designated material of *E. australis* will be required to enhance the available set of taxonomic characters for this group.

Eumunida spinosa Macpherson, 2006

Figs 207, 208

Eumunida spinosa Macpherson, 2006: 670, fig. 1; Baba *et al.* 2008: 20 (list).

Type & locality (not examined). Holotype—MNHN-IU-2011-5527, 23°39.23´ S, 168°16.43´ E, New Caledonia, 900–950 m, male (pcl 18.3 mm).

Material examined. *Seamount 441*, *Northland*: NIWA 3605, NIWA Stn KAH0204/47, 34°2.55′S, 174°49.02′E, 880–792 m, 19 Apr 2002, 1 male (11.2 mm, pcl 7.6 mm).

Kermadec Ridge, *summit of Clark Seamount*: NIWA 82246, NIWA Stn TAN1206/34, 36°26.83–26.98′S, 177°50.31–50.51′E, 850–980 m, 18 Apr 2012, 1 female ov. (24.1 mm, pcl 17.2 mm; sequenced, see Fig. 5); NIWA 82925, NIWA Stn TAN1206/99, 36°26.72–26.57′S, 177°50.35–50.42′E, 850–927 m, 24 Apr 2012, 1 male (~19 mm, pcl ~13.5 mm, carapace damaged; sequenced, see Fig. 5).

Northland: NMNZ CR.025196, Stn K1/009/81, 34°40.8′S, 174°35.4′E, 910–940 m, 21 Nov 1981, 1 female (9.5 mm, pcl 6.5 mm).

Distribution. New Caledonia, Norfolk Ridge, 470–950 m; Northland and the Southern Kermadec Ridge, 792–980 m (Fig. 208).

Habitat. Unknown.

Diagnosis. Carapace with at least 4, more-or-less complete, transverse, piliferous, striae on the posterior region. Lateral margin with 2 anterolateral spines in front of cervical groove; first anterolateral spine long, at least two-thirds length of lateral supraocular spine. Distinct pair of spines on the anterior margin of thoracic sternite 4 present. Cheliped carpus with 3 distal spines and 2 rows of distinct spines on dorsal and mesial surfaces; palm armed with 2 mesial rows of distinct spines, setal pad absent.

Colour in life. Unknown.

Remarks. Four specimens from the Northland and lower Kermadec Ridge area from depths of 792–980 m match the original description well and their CO1

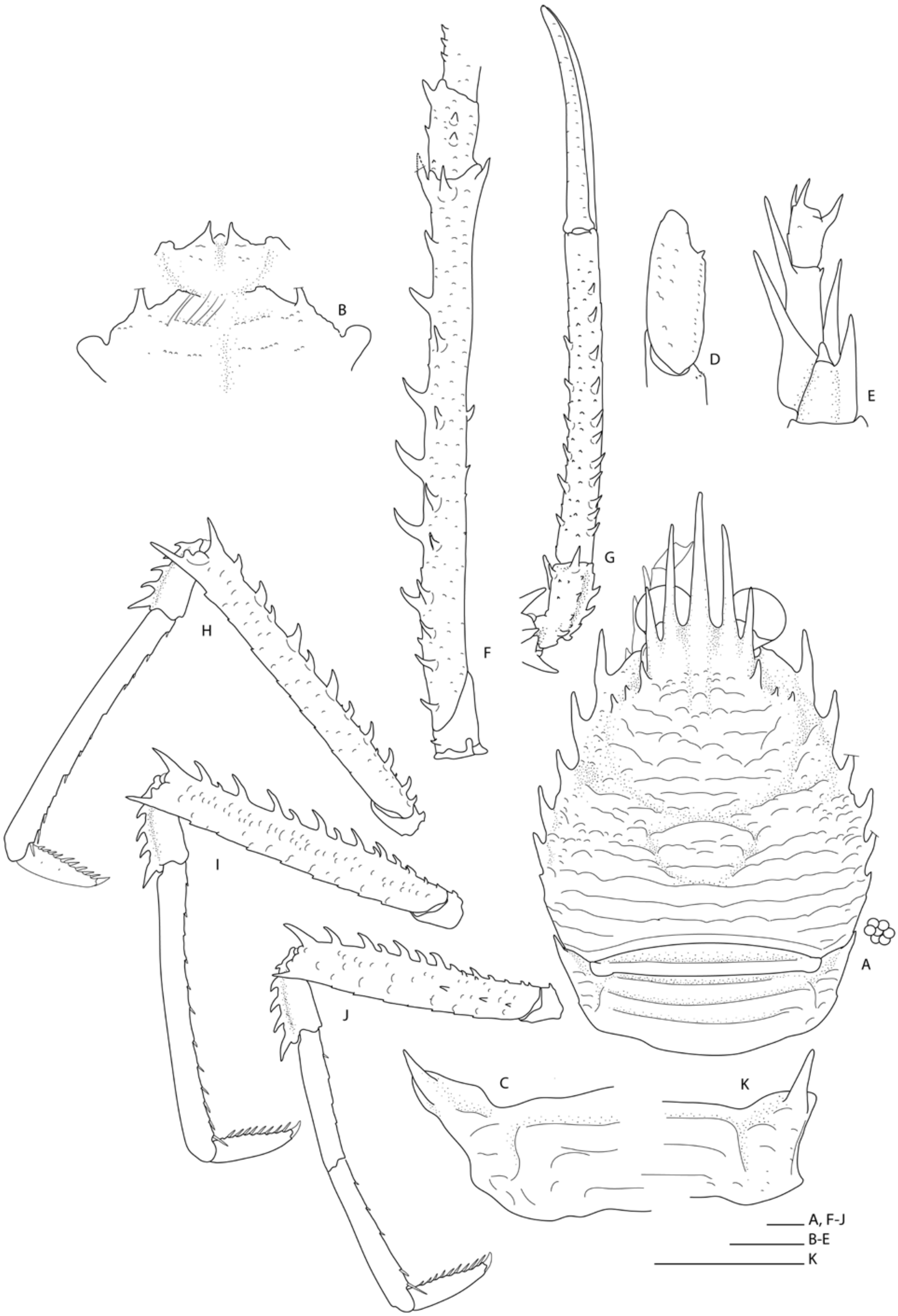
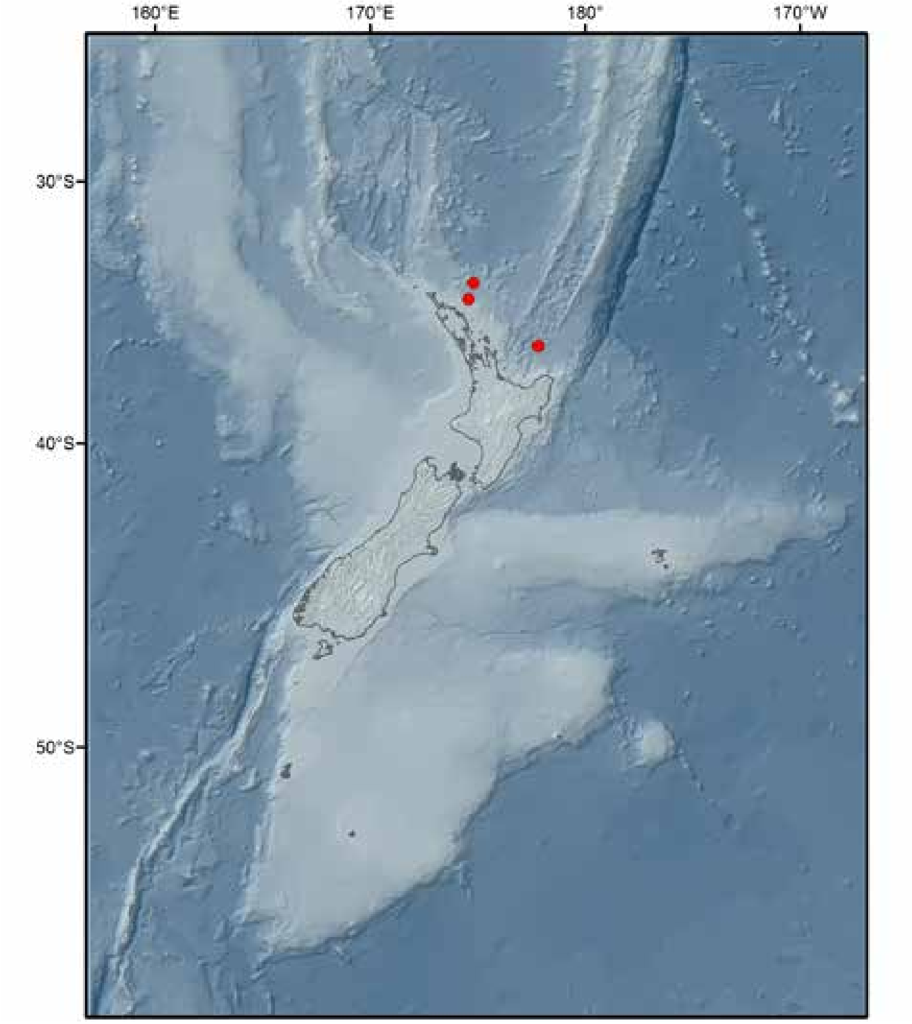


Figure 207. *Eumunida spinosa* Macpherson, 2006, A–J. female ov., NIWA 82246; K. female, NMNZ CR.025196: **A.** carapace, first two abdominal somites and a selection of eggs; **B.** anterior part of sternal plastron; **C.** abdominal somite 2, left, lateral; **D.** distal ischium and merus of right Mxp3, lateral; **E.** left antennal peduncle, ventral; **F.** cheliped ischiomerus and carpus, left, lateral; **G.** cheliped distal articles, right, mesial; **H–J.** P2–4, left, lateral; **K.** abdominal somite 2, right lateral. Scale = 2 mm.

Figure 208. Distribution of *Eumunida spinosa* Macpherson, 2006 around New Zealand.



sequences are nearly identical to that of the holotype (see below). The setal pad on the cheliped palm is absent in all specimens and the double row of spines along nearly the entire length of the mesial palm is distinct. Macpherson (2006) aligned *E. spinosa* with three other species (*E. annulosa*, *E. australis,* and *E. sternomaculata*) based on shared characteristics of the strong spines on thoracic sternite 4 (subgenus *Eumunida*), the complete striae on the posterior carapace region, and the presence of two (rather than three) anterolateral spines on the carapace. Unfortunately, differences were subsequently only discussed by Macpherson (2006) in relation to *E. annulosa*, which has a comparably small anterolateral carapace spine and two distal spines on the cheliped carpus. As discussed below under *E. sternomaculata*, the two rows of mesial spines on the cheliped palm are not unique, and a further diagnostic character is proposed: the cheliped carpus appears to always bear spines on the dorsal and mesial surfaces in *E. spinosa*. These are also present in *E. australis* but clearly reduced or absent in specimens of all sizes in *E. sternomaculata*, although in the largest specimens, a row of small dorsal spines may be present, but the mesial margin remains unarmed.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.2–0.6% (two specimens (NIWA 82246 and 82925) compared to the holotype sequence (Genbank accession number EU243513), Puillandre *et al.* 2011).

Eumunida sternomaculata de Saint Laurent & Macpherson, 1990a Figs 209–214

Eumunida sternomaculata de Saint Laurent & Macpherson, 1990a: 244, figs 1a, 6a, b, 7a–k, 16, 17a, c.; Baba 2005: 211 (synonymies); Baba *et al.* 2008: 20 (list).

Eumunida (*Eumunida*) *sternomaculata*, de Saint Laurent & Poupin 1996: 365 (no record).

Type & locality (not examined). Holotype—MNHN-IU-2008-13009 (MNHN Ga-1780), 23°40.5´ S, 167°45.2´ E, New Caledonia, 470 m, male (pcl 30 mm).

Material examined. *South Norfolk Ridge*: NIWA 123237, NORFANZ Stn TAN0308/126, 33°23.41′S, 170°11.58′E, 469–526 m, 31 May 2003, 1 female (7.3 mm, pcl 5.0 mm); NMNZ CR.025263, NORFANZ Stn TAN0308/126, 33°23.41′S, 170°11.58′E, 469–526 m, 31 May 2003, 3 males (10.8 mm, rostrum broken, pcl 6.9, 5.6, 5.1 mm); NMNZ CR.012765, NORFANZ Stn

Figure 209. Live coloration of *Eumunida sternomaculata* de Saint Laurent & Macpherson, 1990, NMNZ CR.025263, NORFANZ Stn TAN0308/126.

TAN0308/133, 33°23.74′S, 170°13.03′E, 465–490 m, 1 Jun 2003, 1 male (23.6, pcl 14.1 mm; sequenced, see Fig. 5).

West Norfolk Ridge: NIWA 123238, NORFANZ Stn TAN0308/144, 34°22.58′S, 168°25.14′E, 376–380 m, 2 Jun 2003, 1 male (22.7 mm, pcl 8.4 mm; sequenced, see Fig. 5).

Status uncertain. *Eumunida* cf. *sternomaculata*: NMNZ CR.5916, ~13 km northwest of Jackson Head (estimated: 43°53′S, 168°30′E), 240 fms (439 m), 1 female ov. (rostrum damaged, pcl 36.3 mm).

West of Farewell Spit, *Nelson*: NMNZ CR.025193, ?41°S, 171°E′, 482 fms (881 m), CS *Recorder* 1932, 1 female (39.4 mm, pcl 27.4 mm); NMNZ CR.025194, ?41°S, 171°E′, 482 fms (881 m), CS *Recorder* 1932, 1 female (44.5 mm, pcl 28.4 mm).

No station data. NMNZ CR.5917, "probably Bay of Plenty, 1986", 1 male (71.4, pcl 48.6 mm); NMNZ CR.025195, female (44.3 mm, pcl 27.2 mm).

Distribution. New Caledonia and Loyalty Islands, 470–560 m; Norfolk Ridge, Bay of Plenty and eastern Tasman Sea, 376–881 m (Fig. 214).

Habitat. Unknown.

Diagnosis. Carapace with at least 4, more-or-less complete, transverse, piliferous striae on the posterior region. Lateral margin with 2 anterolateral spines in front of cervical groove; first anterolateral spine long, at least two-thirds length of lateral supraocular spine; not or barely reaching to level of hiatus between supraocular spines. Distinct pair of spines on anterior margin of thoracic sternite 4 present. Cheliped merus with small ventral spines; carpus with 3 distal spines, dorsal and mesial surfaces unarmed or with indistinct small spines; palm with setal pad and 2 mesial rows of small spines.

Colour in life. De Saint Laurent & Macpherson (1990a: fig. 1a) figured the live coloration of *E. sternomaculata* from Norfolk Ridge (MUSORSTOM voyage SMIB 2): Carapace and anterior portion of abdomen dark orange, except for rostral and supraocular spines, and ocular peduncle, which are white. Posterior portion of abdomen, tergites and pleura 4–6, pale transparent. The cheliped base colour is bright red to orange, the carpus is white and fingers with broad white bar along distal portion. Walking legs bright orange to red, proximal portions of meri and distal portions of carpi and propodi lighter to white. The NORFANZ specimen (Fig. 209) differs with a light carapace base colour and a dark orange lateral band on either side, more uniformly orange chelipeds, and only a white band on the fixed finger and the tip of the dactylus.

Remarks. Six specimens of *E. sternomaculata* from the West and South Norfolk Ridge in size match the type series, and the CO1 sequences of two specimens are nearly identical to that of the holotype of *E. sternomaculata* reported by Puillandre *et al.* (2011) (see below). Five further specimens are identified here as *E.* cf. *sternomaculata*; these are all large (pcl > 27 mm), appear to have been collected well before at least 1996

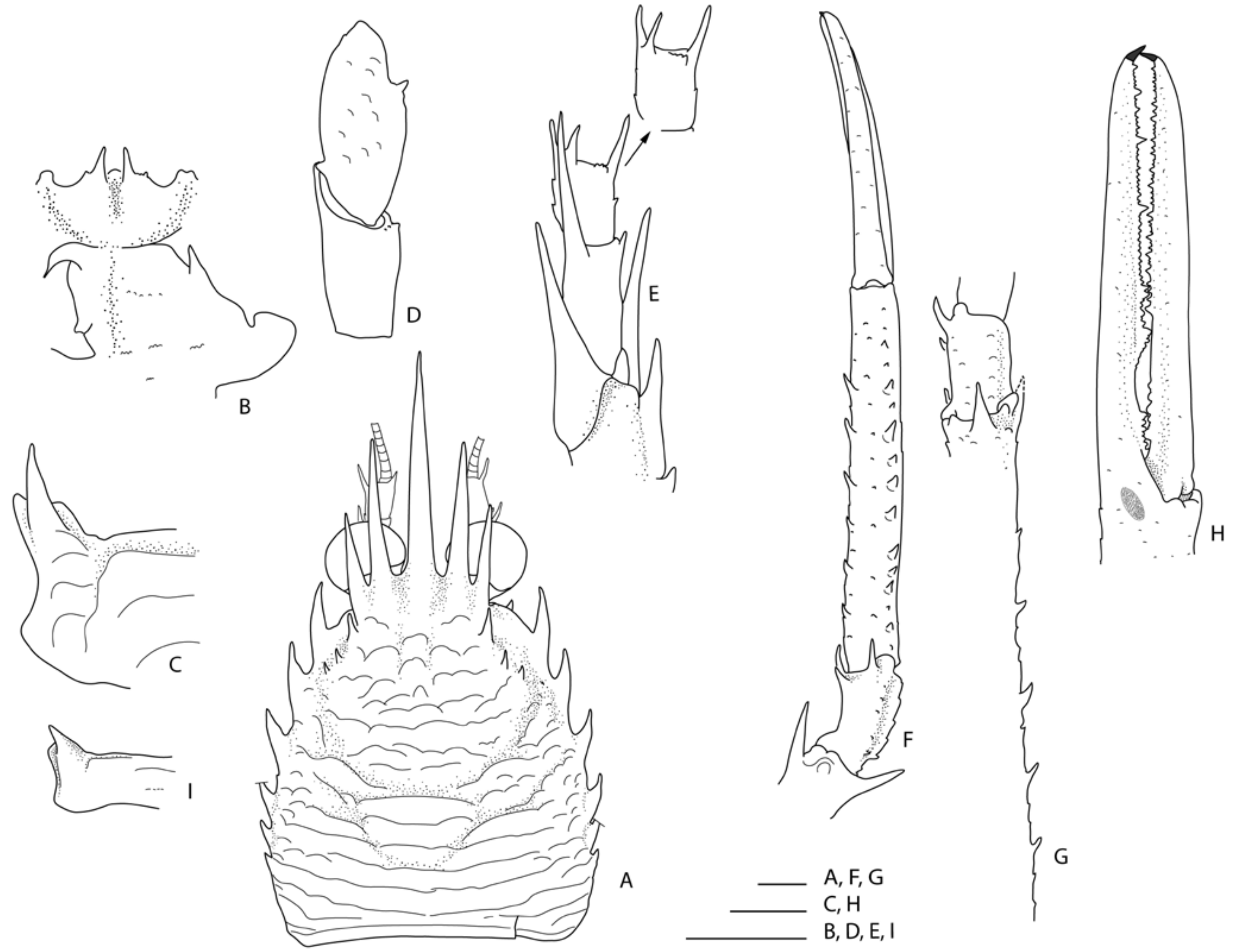


Figure 210. *Eumunida sternomaculata* de Saint Laurent & Macpherson, 1990. A–H. male, NMNZ CR.012765; I. male, NMNZ CR.025263: **A.** carapace, dorsal; **B.** anterior part of sternal plastron; **C.** abdominal somite 2, left, dorsal; **D.** ischium and merus of right Mxp3, lateral; **E.** left antennal peduncle, ventral; **F.** right cheliped distal articles, mesial; **G.** right cheliped merus and carpus, lateral; **H.** right cheliped distal palm and fingers, ventral; **I.** abdominal somite 2, left, dorsal. Scale = 2 mm.

and have limited locality information (one specimen has none). One unusually large male collected ca. 1986, 'probably from Bay of Plenty', (pcl 48.6 mm, NMNZ CR.5917, Fig. 211), exceeds the reported size range by more than 12 mm (maximum size of males known to date is 36 mm pcl). However, its overall morphology matches the large female holotype depicted by De Saint Laurent & Macpherson (1990a: fig. 6a, b). The other specimens are all females, of which two (NMNZ CR.025193 and NMNZ CR.025194) were collected off the west coast of the South Island, not far from the type locality of *E. australis* (Fig. 206). Unfortunately, none of these are suitable for standard DNA sequencing.

De Saint Laurent & Macpherson (1990a) described *E. sternomaculata* based on many specimens from around New Caledonia. They noted the similarities to *E. australis* de Saint Laurent & Macpherson (1990b), but distinguished the two species based on whether the region immediately behind the rostrum is elongate (*E. sternomaculata*) or short (*E. australis*); whether the lateral supraocular spines are subparallel (*E. sternomaculata*) or divergent (*E. australis*); and whether the first anterolateral spine reaches the hiatus between the supraocular spines at most (*E. sternomaculata*) or reaches to about midlength of the lateral supraocular spine (*E. australis*). Later, de Saint Laurent & Poupin (1996) also included the difference in the ventral armature of the cheliped merus with *E. sternomaculata* having 'mostly only one well-developed ventral spine' and *E. australis* having 'a row of 5–8 ventral spines'. However, differentiating these two species proves to be problematic: the reported size range (pcl) of *E. sternomaculata* is 7.5–36 mm and ~6.6–17 mm for *E. australis*, and it is apparent from the morphometric and meristic comparisons of *E. sternomaculata* and *E. australis* (de Saint Laurent & Macpherson 1990a: table 3, 4) that the two species overlap in all measurements considered. Secondly, the NORFANZ specimens of *E. sternomaculata*, whose CO1 sequence match those of the type series, have both an elongate rostrum and,

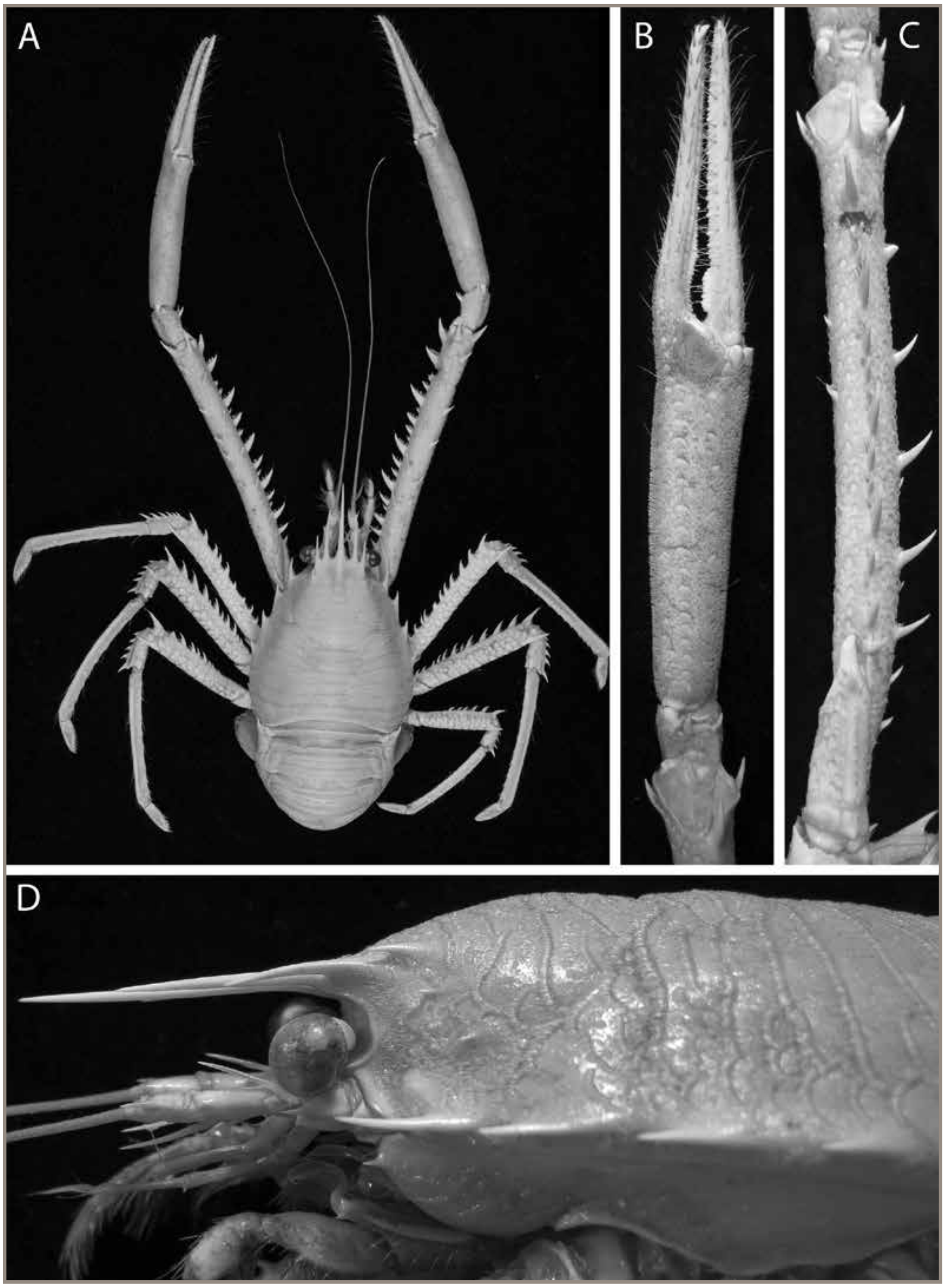


Figure 211. *Eumunida* cf. *sternomaculata* de Saint Laurent & Macpherson, 1990, male, pcl 48.6 mm, NMNZ CR.5917: **A.** dorsal habitus; **B.** right cheliped palm and fingers, ventral; **C.** right cheliped ischium, merus, carpus, ventral; **D.** anterior portion of cephalothorax, lateral.

because of this, the first anterolateral spine barely reaches the hiatus of the lateral supraocular spine, which matches *E. sternomaculata*. Similarly, the supraocular spines are not subparallel in any of the specimens; indeed, de Saint Laurent & Macpherson (1990a) illustrated both divergent supraocular spines (large male, pcl 30 mm holotype: fig. 6b and the smaller male, 5.0 mm paratype: fig. 7b) and subparallel spines (female, 16 mm paratype); hence this character might vary with size. Finally, all the specimens have more than one small but distinct spine along the ventral margin of the cheliped merus, which also aligns them morphologically with *E. australis*. A more detailed examination of the type material of *E. australis* will be required to establish consistent morphological characters to separate or to synonymise these species. Until then, the New Zealand material is identified as *E. sternomaculata*.

Distinguishing *E. sternomaculata* from *E. spinosa*, described from New Caledonia and the Norfolk Ridge, is based on the absence of the setal pad on the cheliped palm and the presence of two mesial rows (ventromesial and dorsomesial) of spines on the cheliped palm. The setal pad is present in both *E. sternomaculata* and *E. australis,* and the authors noted that the other two species only bear one row of spines on the cheliped

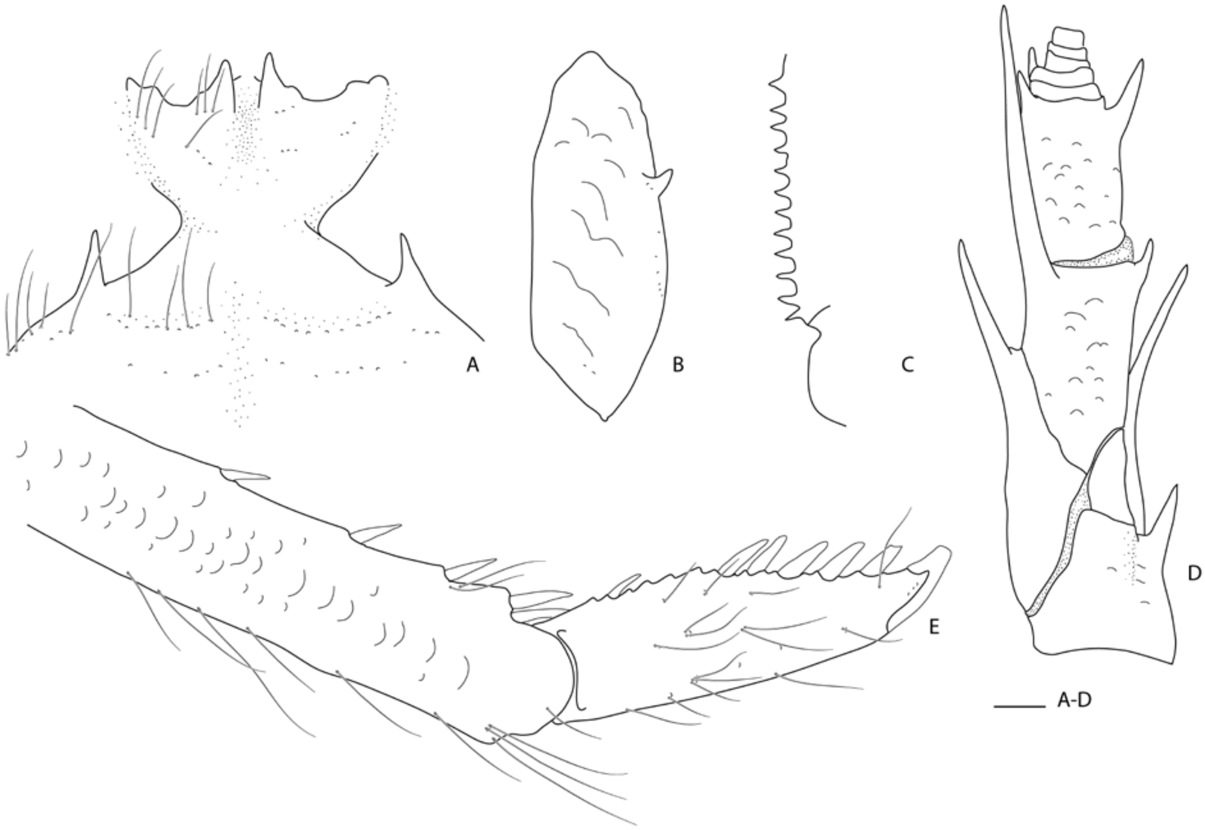


Figure 212. *Eumunida* cf. *sternomaculata* de Saint Laurent & Macpherson, 1990, male, NMNZ CR.5917: **A.** anterior part of sternal plastron; **B.** merus of right Mxp3, lateral; **C.** crista dentata of left Mxp3; **D.** left antennal peduncle, ventral; **E.** P4 distal portion of propodus and dactylus, lateral. Scale = 2 mm.

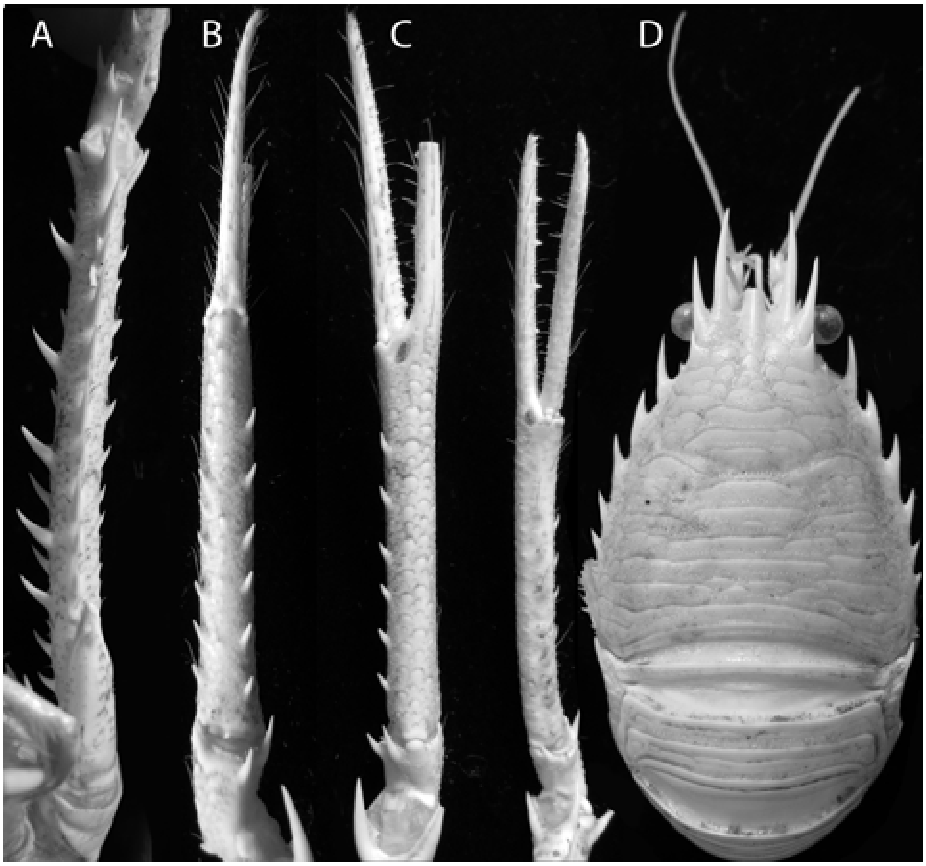
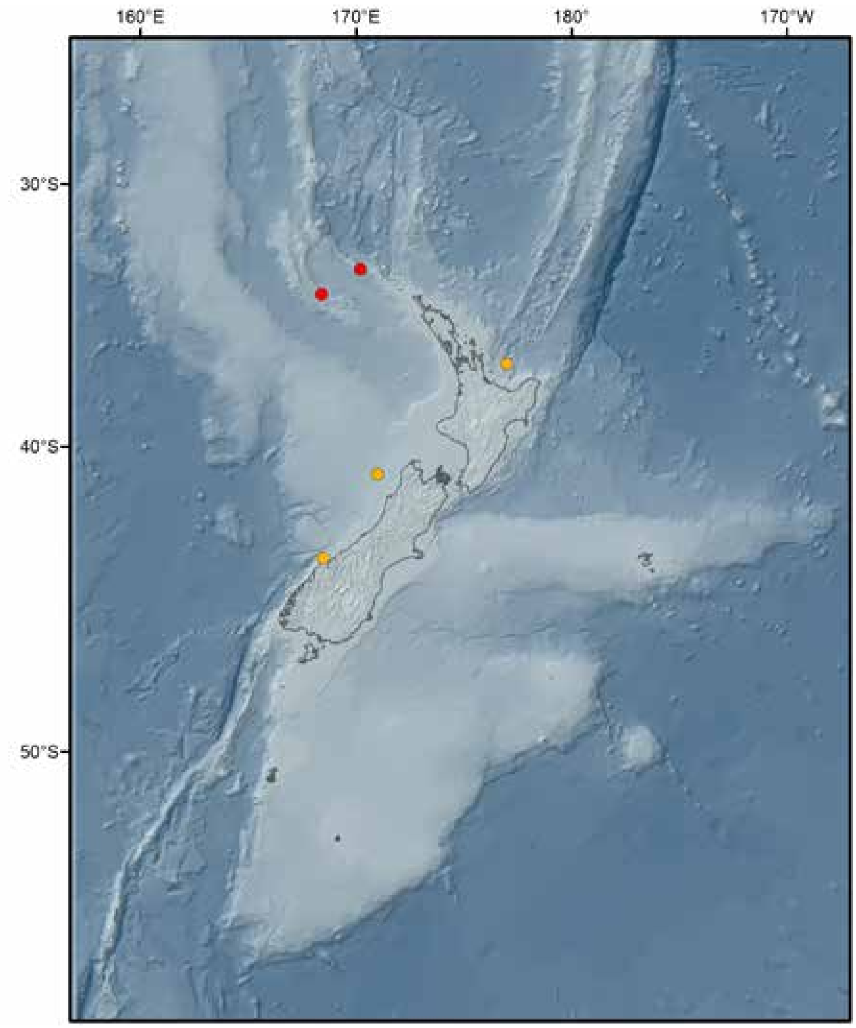


Figure 213. *Eumunida* cf. *sternomaculata* de Saint Laurent & Macpherson, 1990, female ov., NMNZ CR.5916: **A.** left cheliped, ischium, merus, carpus and distal propodus, ventral; **B.** left cheliped, carpus, palm and fingers, mesial; **C.** left and right chelipeds, distal carpus, palm and fingers, ventral; **D.** carapace and abdomen, dorsal.

Figure 214. Distribution of *Eumunida sternomaculata* de Saint Laurent & Macpherson, 1990 (red) and *E.* cf. *sternomaculata* de Saint Laurent & Macpherson, 1990 (orange) around New Zealand.



palm. With regards to the morphological distinction between *E. sternomaculata* and *E. spinosa*, the presence or absence of the cheliped setal pad appears to be valid, although it can be faintly indicated in small specimens of *E. sternomaculata*. The double row of spines along the mesial palm margin, however, is clearly present in all specimens. De Saint Laurent & Macpherson (1990a: fig. 7i–j) illustrated the dorsal and ventral view of the right cheliped of *E. sternomaculata* and both show a row of small spines. Notably, the largest male specimen (NMNZ CR.5917, pcl 49 mm,) appears to have the cheliped palm unarmed, but two rows of small spines are discernible among the piliferous cover of the integument (Fig. 211). All the large females of *E.* cf. *sternomaculata* bear distinct spines (Fig. 213).

As discussed for *E. spinosa* above, a diagnostic character that is proposed to distinguish *E. spinosa* from *E. sternomaculata* is the armature of the cheliped carpus surface: *E. spinosa* bears two rows of spines, which are absent in *E. sternomaculata*. The cheliped carpus is similarly unarmed in *E. balteipes* Osawa & Higashiji, 2019, recently described from southwestern Japan, but it is distinct, with the thoracic sternite 3 anteriorly angular (versus armed with sharp spines as in *E. sternomaculata*, *E. spinosa*, and *E. australis*), and the cheliped palm being unarmed dorsomesially (versus bearing a row in spines).

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.2–0.7% (comparing two specimens, (NMNZ CR.012765, NIWA 123238) with the holotype sequence (Genbank accession number EU243561, Puillandre *et al.* 2011).

Eumunida sp. Figs 215–217; Seafloor Image 10

Material examined. *Kermadec Ridge*, *Hinepuia Volcano*: NIWA 90215, submersible *Shinkai* Stn YOK1311/1374/25, 26°24.12′S, 177°14.64′W, 499 m, 30 Oct 2013, 1 female (18 mm, pcl 11.5 mm; sequenced, see Fig. 5).

Colville Ridge Scoria Cone: NIWA 85973, NIRVANA Stn TAN1213/21, 30°07.98′S, 179°46.16′E, 720–573 m, 18 Oct 2012, 1 female (13 mm, pcl 9 mm; sequenced, see Fig. 5).

Distribution. Colville Ridge and Hinepuia Volcano, Kermadec Ridge, 499–720 m (Fig. 217).

Habitat. One female (NIWA 90215) was collected by submersible *SHINKAI* 6500 during a dive over the active Hinepuia Volcano on the northern Kermadec

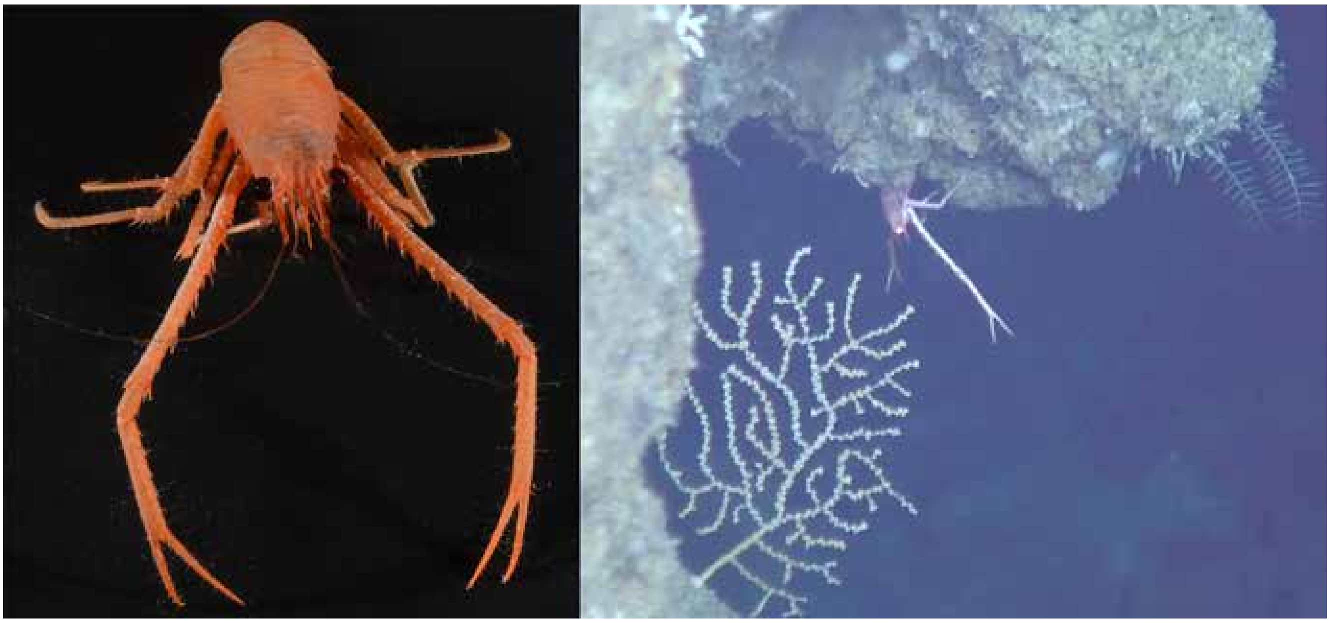


Figure 215. Live coloration of *Eumunida* sp.; left, female, pcl 11.5 mm, NIWA 90215; right, *SHINKAI* 6500 Stn YOK1311-1374, screenshot taken on 30 Oct 2013, time 10:26:44, 495 m. Image courtesy of Shinji Tsuchida, JAMSTEC, QUELLE voyage.

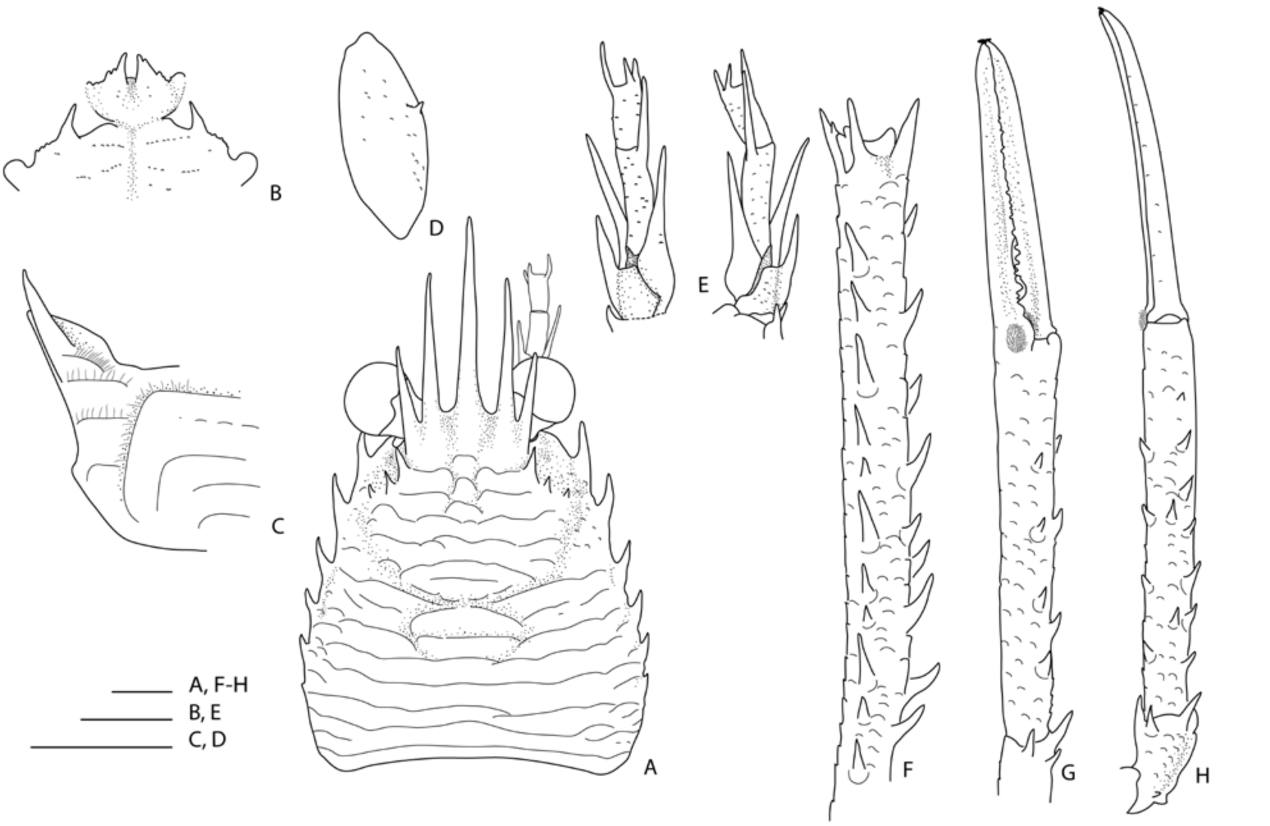


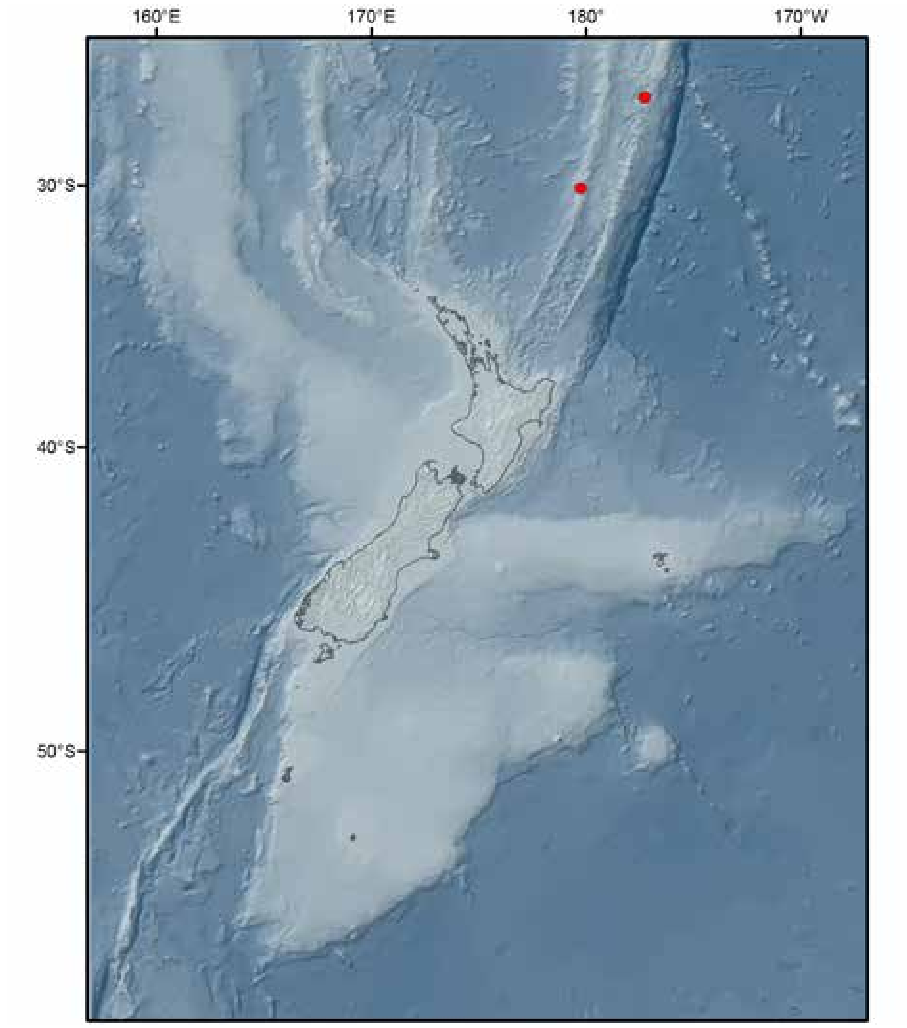
Figure 216. *Eumunida* sp., female, NIWA 90215: **A.** carapace, dorsal; **B.** anterior part of sternal plastron; **C.** abdominal somite 2, left dorsal; **D.** merus of right Mxp3, lateral; **E.** left and right antennal peduncles, ventral; **F.** cheliped merus, right, lateral; **G.** cheliped distal carpus, palm and fingers, right, ventral; **H.** cheliped carpus, palm and fingers, right, mesial. Scale = 2 mm.

Ridge. It was seen clinging to a rock ledge overhanging a colony of gorgonian fan coral (? Plexauridae) (Fig. 215).

Colour in life. Uniformly orange (Fig. 215).

Remarks. These two small specimens were collected from two undersea features on the Colville and Kermadec Ridge. Morphologically, they appear to match the material identified as *E. sternomaculata* from the Norfolk Ridge (see above); but the DNA sequence divergence is 7–9% compared to the holotype sequence of *E. sternomaculata*. Therefore, these specimens are considered to be distinct from *E. sternomaculata*. Some morphological differences that are noted might prove to be diagnostic, but in the absence of a range

Figure 217. Distribution of *Eumunida* sp. around New Zealand.



of specimens, it would be premature to use these as a basis on which to establish these two specimens as a new species: the antennal article 2 is unarmed on the distomesial margin in *Eumunida* sp., while it bears a small spine in the other three *Eumunida* species; the ventral margin of the cheliped merus is entirely unarmed in *E.* sp. and armed with at least one distinct spine in *E. sternomaculata* and *E. australis*; the dorsal surface of the cheliped palm bears additional spines to the dorsomesial row that is present in the other species. The lateral margins of the carapace appear to bear fewer short striae in *Eumunida* sp. compared to *E. sternomaculata*. These characteristics vary allometrically in other species of the genus and further specimens of different sizes are required to evaluate the utility of these features.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 2.4% (two specimens, divergences may be considered marginal for conspecific sequence divergence). Closest interspecific sequence divergences (see Puillandre *et al*. 2011 for GenBank accession numbers): 4.5–6% (*E. treguieri* de Saint Laurent & Poupin, 1996), 6.5–7.0% (*E. sternomaculata* holotype), 7.5% (*E. spinosa* holotype).

Genus ***Pseudomunida*** Haig, 1979

Pseudomunida Haig, 1979: 89; Baba *et al*. 2008: 24; Macpherson & Baba 2011: 51.

Diagnosis. Carapace with very weak, interrupted transverse striae. Dorsal surface unarmed. Rostrum spiniform. Mesial supraocular spines well developed, lateral supraocular spines vestigial or barely discernible. Anterior margin of sternite 4 with pair of spines. Antennal peduncles having each article with distal spine(s), antennal scale distinct. Mxps 3 somewhat separated from each other to make Mxps 2 visible but Mxps 1 not visible. Mxps 2 close to each other. Cheliped carpus with 2 ventrodistal spines. P2–4 meri and carpi with row of spines on dorsal crest. G1 and G2 absent (Macpherson & Baba 2011).

Type species. *Pseudomunida fragilis* Haig, 1979, by original designation and monotypy.

Pseudomunida fragilis Haig, 1979

Figs 218–221, Seafloor Images 11, 12

Pseudomunida fragilis Haig, 1979: 89, figs 1, 2; Baba 2005: 25, 214 (synonymies); Macpherson 2006: 673; Baba *et al*. 2008: 24 (list and synonymies); Schnabel & Ahyong 2010: 59, fig. 1B; Macpherson & Baba 2011: 51, fig. 2.1I.

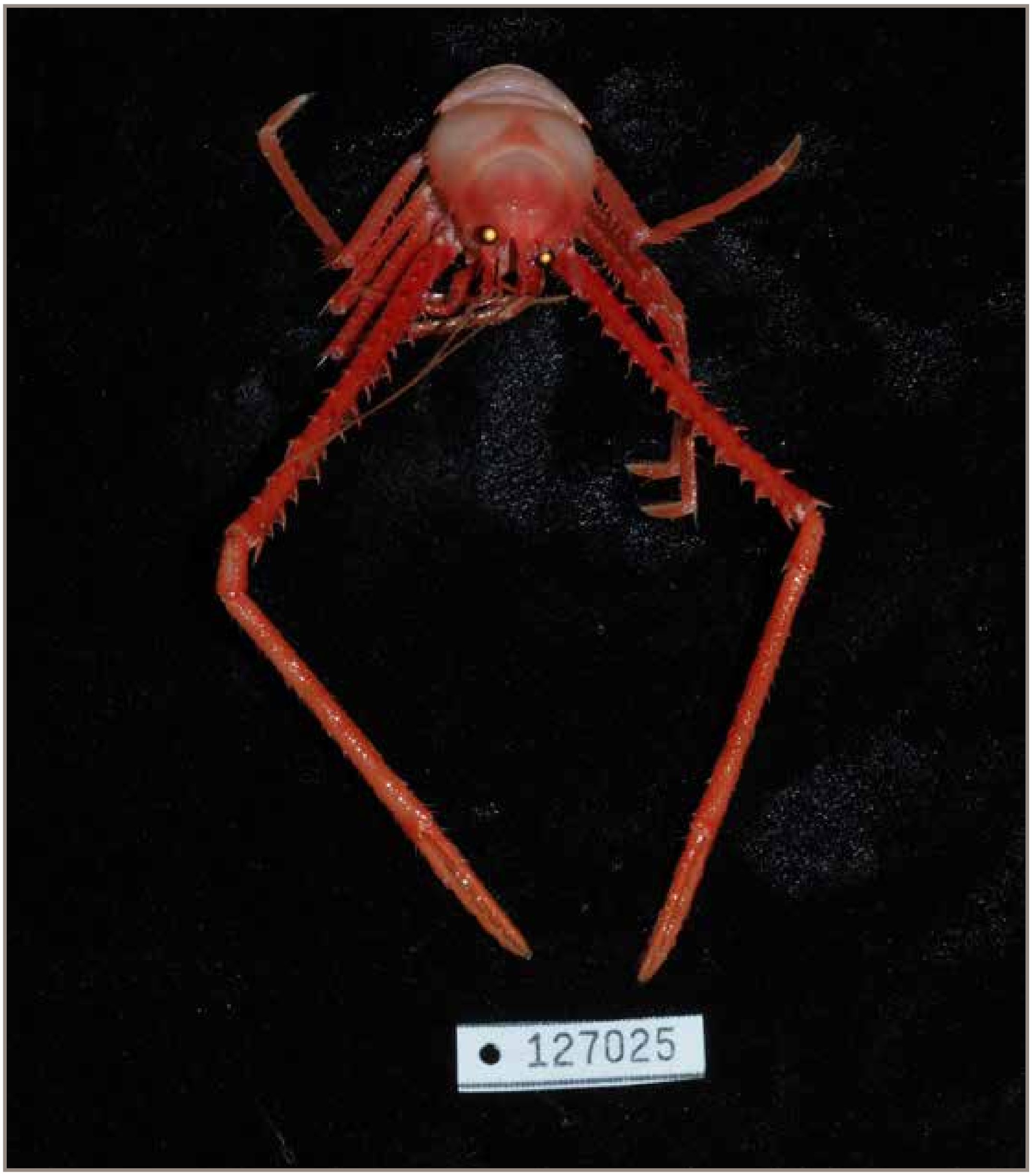


Figure 218. *Pseudomunida fragilis* Haig, 1979, male, pcl 18.0 mm, NIWA 127025, RV *Sonne* Stn SO254_08ROV02. Image captured by Peter Schupp onboard RV *Sonne* (voyage SO254), courtesy of Project PoriBacNewZ, GEOMAR & ICBM.

Type & locality (not examined). Holotype—BPBM S7996, 21°25.4´ N, 158°16.78´ W, off Waianae, Oahu, Hawaii, 969–1280 m, female ov. (cl 19.8 mm).

Material examined. *Kermadec Ridge*, *Havre Volcano western flank*: NIWA 24583, NIRVANA Stn TAN1213/39, 31°06.25–06.11′S, 179°05.97′–05.97′W, 1022–1034 m, 20 Oct 2012, 1 ov. female (broken rostrum and carapace, pcl ~14 mm; sequenced, see Fig. 5).

Seamount 114, *East of Three Kings Ridge (International Waters)*: NIWA 127025, PoriBacNewZ ROV *KIEL* 6000 Stn SO254/08ROV2, 31°17.94′S, 175°12.03′E, 1143.7 m, 31 Jan 2017, 1 male (26.9 mm, pcl 18.0 mm; sequenced, see Fig. 5), from primnoid fan.

Distribution. Oahu, Hawai'i, 969–1280 m; Bonin Islands, 1370 mm; Norfolk Ridge, 1098–1480 m; Kermadec Ridge, 1022–1034 m (Fig. 221).

Habitat. The RV *Sonne* specimen (NIWA 127025) was collected with a large primnoid coral fan (? *Callogorgia*) using the ROV *KIEL* 6000 and video footage clearly shows the large squat lobster perched on the side of the fan (Seafloor Image 3). A specimen tentatively identified as *P. fragilis* and photographed during the same dive shows the squat lobster on a small rocky outcrop, surrounded by a few stylasterid coral colonies and a glass sponge (Seefloor image 4). There is no indication of whether the Havre Volcano specimen (NIWA 24583) was collected in association with corals, but a range of chrysogorgiid, coralliid, isidid, primnoid gorgonians, and a large black coral (*Bathypathes* sp.) were collected at the same station.

Diagnosis. As for genus.

Colour in life. Anterior portion of body (including

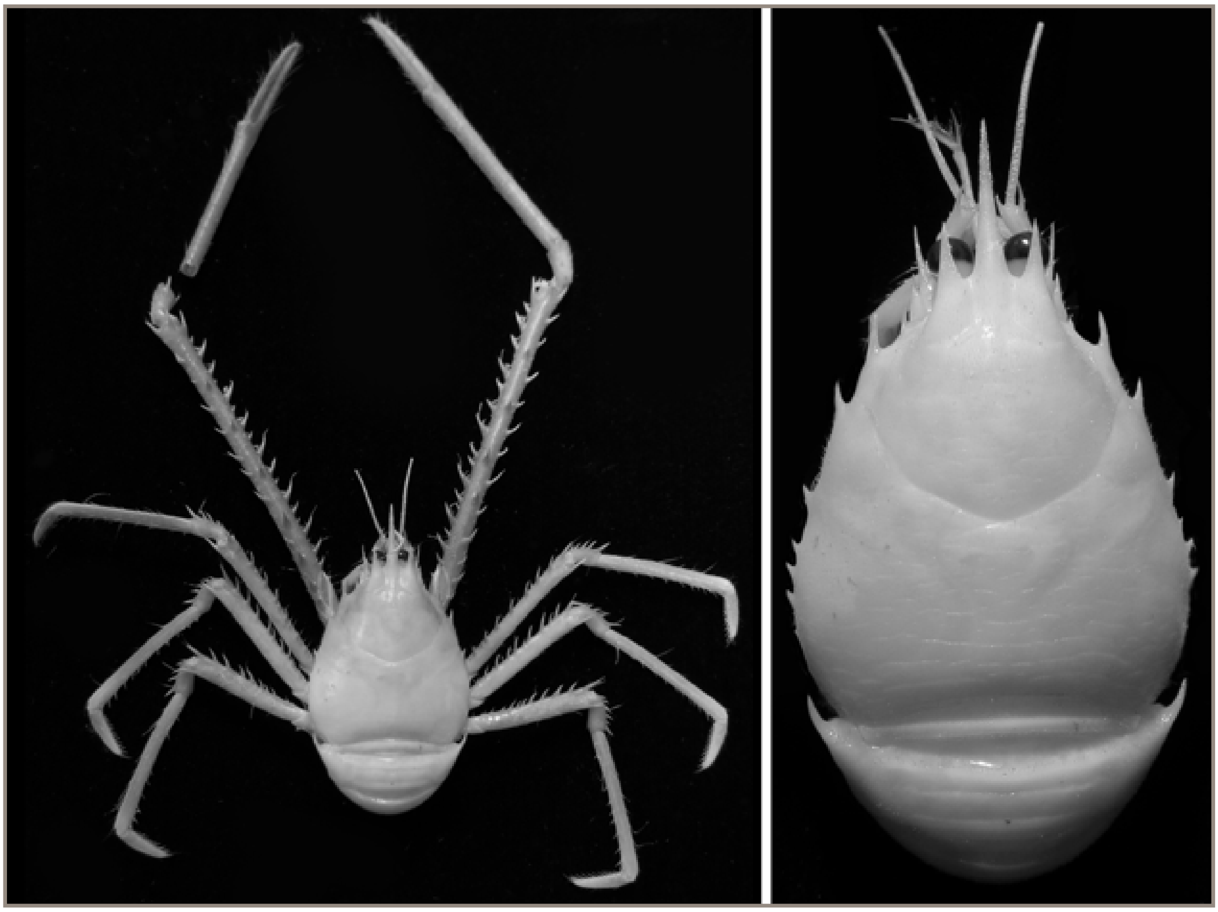


Figure 219. *Pseudomunida fragilis* Haig, 1979, male, pcl 18.0 mm, NIWA 127025, dorsal habitus (left); carapace and abdomen, dorsal (right).

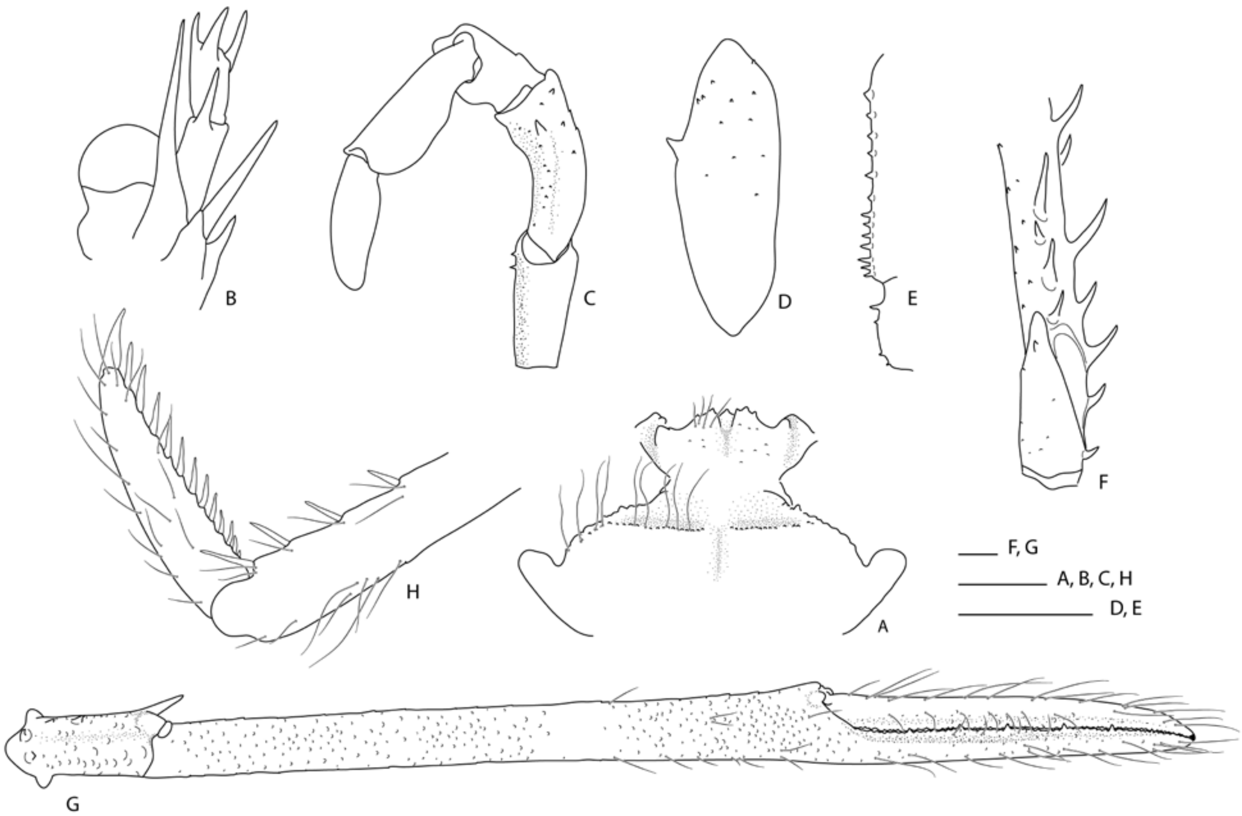
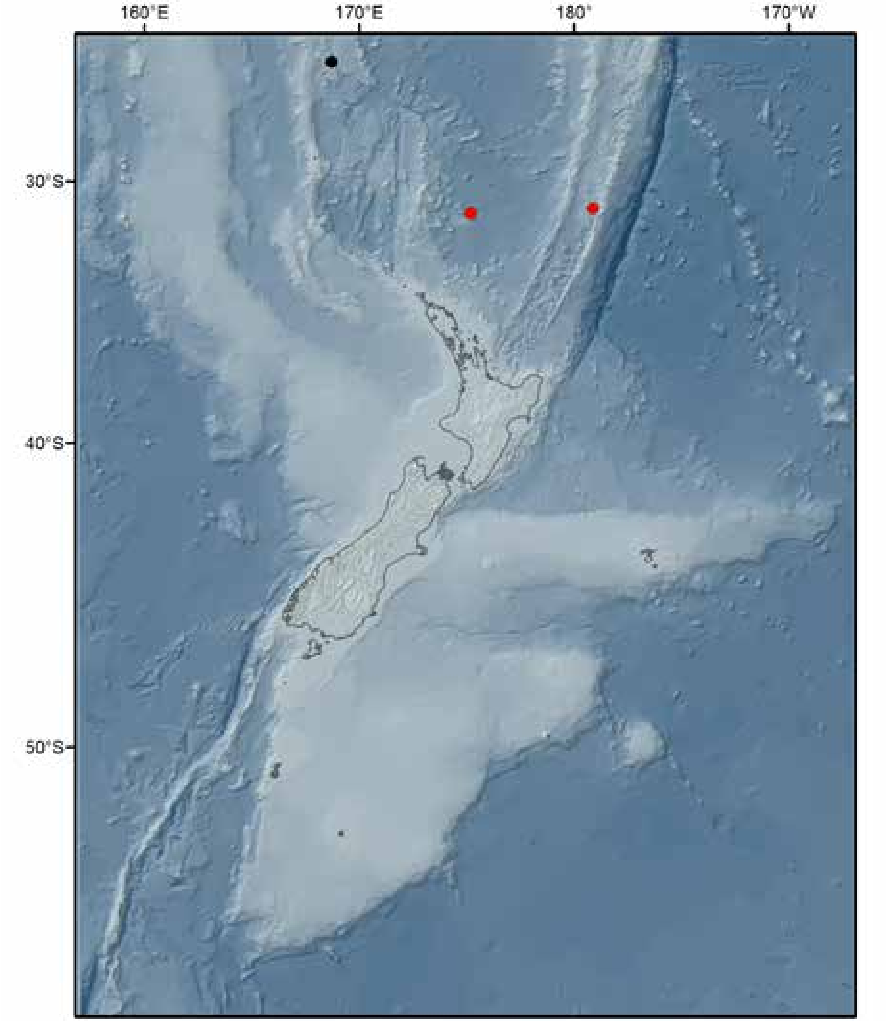


Figure 220. *Pseudomunida fragilis* Haig, 1979, male, pcl 18.0 mm, NIWA 127025: **A.** Sternite 3 and 4, ventral; **B.** left ocular peduncle and antenna, ventral; **C.** Mxp3 endopod, left, ventral; **D.** Mxp3 merus, left, lateral; **E.** Mxp3 crista dentata, left; **F.** right cheliped proximal articles, mesial; **G.** right cheliped, carpus, palm and fingers, dorsal; **H.** dactylus and distal portion of propodus of right pereopod 4, lateral. Scale bars = 2 mm.

Figure 221. Distribution of *Pseudomunida fragilis* Haig, 1979 around New Zealand. The black circle shows the location of the Macpherson (2006) record.



rostrum), gastric, anterior branchial and hepatic regions bright red. Cardiac region paler orange, remaining carapace and abdomen pale peach. Pereopods bright red; distal half of cheliped (carpus, palm and fingers) orange (Fig. 218).

Remarks. Originally described from two ovigerous females from Hawaii (Haig 1979), *Pseudomunida fragilis* has subsequently been reported from the western Pacific: a single female from Ogasawara (= Bonin) Islands, south of Japan (Baba 2005) and five specimens, including two smaller males (pcl 14.2 and 16.3 mm) from Norfolk Ridge, New Caledonia (Macpherson 2006). The latter material was collected about 250 km south of New Caledonia at 25°04′S and 168°44′E which places the record at the northernmost boundary of the New Zealand charting area (Fig. 221). Two new records of *Pseudomunida fragilis* are reported here. Both match the original description of the species well, with slight variation as follows:

- the lateral carapace margins of the holotype are each armed with five spines (including anterolateral spine). The New Zealand specimens have six or seven spines, with the additional spines being situated along the posterior branchial margin (Fig. 219). Haig (1979) notes that the carapace margin is smooth posterior to the level of greatest breadth of carapace in the type;
- in both New Zealand specimens, the distal spine on antennal article 3 reaches or slightly overreaches the end of the antennal peduncle (Fig. 220B). In the holotype, it 'extends well beyond base of fifth segment' and is illustrated to fall short of the end of the peduncle (Haig 1979: 91, fig. 2b);
- the cheliped of the New Zealand female is missing and the male cheliped mostly matches the description but is slightly less spinose; the merus has about 11 spines along the dorsal margin instead of 15–17 and is missing 'three small, widely spaced spines on ventromesial surface' of the palm of the holotype. The palm of the holotype is illustrated (Haig 1979: fig. 1d) and nearly 16 × as long as wide, while in the New Zealand male it is slightly stouter at nearly 12 × (Fig. 220G). This probably reflects typical allometric and sexual dimorphism;
- the walking legs are similar, with the propodi bearing 10–12 (female) and 9–11 (male) movable spines along the flexor margin in addition to the distal pair; and the dactyli are furnished with 9 or 10 (female) and 12 or 13 (male) sharp inclined spines along the flexor margin (Fig. 220H). These

characters are not noted in the text of the description but appear to match the illustrations of the holotype;

- none of the New Zealand specimens bears an additional vestigial lateral supraocular spine as noted by Baba (2005) for the Bonin Islands specimen.

The ovigerous female (NIWA 24583) had nearly 160 eggs retained under the abdomen, each of them small (diameter 0.6 mm).

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.2–0.3% (three New Zealand specimens, including the sequence reported by Macpherson (2006), Halipro 2, Stn BT55, MNHN-IU-2014-19305), kindly provided by Enrique Macpherson). Interspecific levels of sequence divergences of 6.5% were revealed by a specimen collected in French Polynesia (BENTHAUS Stn DW1873, 4 Nov 2002), kindly provided by Régis Cléva (MNHN).

Family **Sternostylidae** Baba, Ahyong & Schnabel, 2018

Sternostylidae Baba, Ahyong & Schnabel, 2018: 81.

Diagnosis. Carapace spinose, without transverse striae. Rostrum spiniform, supraocular spines absent. Thoracic sternite 3 anteromedially produced and sloping down anteriorly, with pair of spines directly behind anterior margin. Sternal plastron concavely constricted between sternites 4–5 (often hourglass-shaped). Pleuron of abdominal somite 2 without anterolateral spine. Tailfan folded beneath preceding abdominal somite; telson divided into anterior and posterior lobes. Eyes well developed. Antennal scale present or absent. Mxp1 without epipod. Mxps3 close to each other. Pereopods 2–4 dactyli ending in fixed, corneous spine. Mxp3 to pereopod 4 each with two arthrobranchs; pereopod 5 with one arthrobranch; pereopods 2–4 each with one pleurobranch. Male pleopods 1 and 2 present (Baba *et al.* 2018).

Remarks. Baba *et al.* (2018) recently separated the genus *Gastroptychus* into two genera. Twelve species were referred to the new genus *Sternostylus* based on the shape of sternite 3, the placement of Mxps3 close to each other at base, and the dactyli of the pereopods 2–4 ending in a fixed, corneous spine. This is also supported by molecular evidence which is also indicated in the preliminary CO1 gene tree in Fig. 5. Indeed, the phylogenetic tree indicates the Sternostylidae in an intermediate position between Kiwaidae and Chirostylidae. This position was proposed by Baba *et al.* (2018), based on the combination of the morphologically plesiomorphic character, appressed bases of Mxp3, which is shared with the Eumunididae and Kiwaidae but derived in Chirostylidae, and derived features, which it shares with Chirostylidae (absence of the Mxp1 epipod, absence of supraocular spines, presence of male pleopod 1).

With the description of one new species, two species are now known in the New Zealand region.

Type genus. *Sternostylus* Baba, Ahyong & Schnabel, 2018, by monotypy.

Genus ***Sternostylus*** Baba, Ahyong & Schnabel, 2018

Sternostylus Baba, Ahyong & Schnabel, 2018: 81.

Diagnosis. Carapace with dorsal and lateral spines; dorsal surface lacking transverse striae, posterolateral margin barely excavated. Rostrum spiniform, basal part subtriangular. Thoracic sternite 3 with anterior ridge in midline flanked by spine directly behind anterior margin, anteriorly produced and steeply sloping down (in ventral view) to anterior sternite; sternite 4 with 2 lateral spines on each side, proximal strong. Antennal peduncle slender, scale present or absent. Mandible with serrate incisor margin. Mxp1 exopod with smooth, non-annulated flagellum. Left and right Mxps3 close to each other at base, bases appressed, without intervening space to accommodate distal articles when folded; endopod short relative to breadth, especially propodus. Pereopods 1–4 long and slender, with numerous spines usually arranged in longitudinal rows (Baba *et al.* 2018).

Remarks. *Sternostylus* species appear to be common associates of deepsea corals (Baeza 2011, Wicksten 2020). A detailed analysis of video footage of *G. formosus* Baba & Haig, 1990 (now *Sternostylus formosus*) taken at 600–1200 m depth off Ireland (Le Guilloux *et al.* 2010) showed that adults displayed a specific habitat preference, exclusively found on large gorgonian (*Paramuricea* sp.) and large antipatharian corals (*Bathypathes* sp., *Leiopathes* sp.) with a strong preference for *Leiopathes* sp. as a host. Baba & Haig (1990: 854) indicated that *S. iaspis* (Baba & Haig, 1990) is "usually seen on gorgonians and antipatharians (A. Genin, pers. comm.)" in the northeastern Pacific, Rice & Miller (1991) observed and described a new species, *S. salvadori*, on a large arborescent *Keratoisis* bamboo coral off Florida, and Wicksten (2020) reported at least one unidentified species on antipatharians, a wide variety of alcyonaceans, and precious coral.

Hendrickx *et al.* (2014) provided *in situ* observations for *S. perarmatus* (Haig, 1968) in the Gulf of California on the large arborescent gorgonian *Callogorgia* and one or two large unidentified sponges. The video footage also captured *S. perarmatus* picking up what appeared to be a large particle of material from the corals and taking it to its mouth. Hendrickx *et al.* (2014) continued to describe that it was apparent that the coral or sponge matrix was obviously capturing particulate matter, hypothesising that the squat lobster was taking advantage of this passive filtering, and feeding on the large particles of debris. In turn, it was also benefiting the coral in preventing it from being smothered.

Le Guilloux *et al.* (2010) presented gut-analysis data that showed 'miniscule crustacean' particles, which was interpreted as having originated from the particulate matter trapped in the coral mucus. They pointed to the shape and the setation of the cheliped fingers and argued that these are well-suited to brushing through coral mucus and collecting food particles from nearby coral branches. They drew analogies to the mutualistic relationship between the ophiuroid *Astrobrachion constrictum* (Farquhar, 1900) that lives on the New Zealand antipatharian *Antipathes fiordensis* Grange, 1990. Both Le Guilloux *et al.* (2010) and Hendrickx *et al.* (2014) noted that none of these were ever encountered on the sea floor or other conceivably suitable hosts such as large hard corals (e.g. *Lophelia pertusa* (Linnaeus, 1758) or *Madrepora oculata* Linnaeus, 1758) and the authors concluded that it is a specific obligate commensal. Most likely, the New Zealand *Sternostylus* species live in similar associations, and opportunistic seafloor footage supports this.

Type species. *Ptychogaster formosus* Filhol, 1884, by original designation.

Key to species of *Sternostylus* from New Zealand

1. Abdominal tergites 3 and 4 unarmed. Mxp3 with propodus extensor margin smooth ....***S. niwa* sp. nov.**

– Abdominal tergites entirely covered with spines. Mxp3 with propodus extensor margin bearing distinct spines ....***S. rogeri*** (Baba, 2000)

***Sternostylus niwa* sp. nov.** Figs 222–226

Material examined. Holotype NIWA 72854, NIWA Stn TAN1104/122, 35°52.19–51.95′S, 178°26.32–26.07′E, Rumble III Seamount, Southern Kermadec Ridge, 1235–1485, 19 Mar 2011, 1 female (16.8 mm, pcl 13.6 mm; sequenced, see Fig. 5). **Paratypes** *Southern Kermadec Ridge*, *Thompson Seamount*: NIWA 65042, NIWA Stn TAN1007/123, 35°17.03–17.12′S, 178°51.76–51.83′E, 1244–1276 m, 08 Jun 2010, 1 female (14.7 mm, pcl 12.2 mm). *Southern Kermadec Ridge*, *Lillie Seamount*: NIWA 72881, NIWA Stn TAN1104/123, 35°51.65–51.39′S, 178°26.90–26.67′E, 1251–1478, 19 Mar 2011, 1 male (16.6 mm, pcl 12.8 mm); NIWA 72923, NIWA Stn TAN1104/124, 35°51.44–51.41′S, 178°26.87–26.55′E, 1237–1460 m, 19 Mar 2011, 1 male (carapace, sternum and abdomen damaged; sequenced, see Fig. 5).

Other material. *Tasmania (Australian EEZ)*: SAM C6088, 44°**22.7**′S, 147°7.3′E, 1050–1170 m, 12 Feb 1992, 2 females ov. (37.6, 28.7 mm, pcl 30.6, 24.0 mm).

Type locality. Rumble III Seamount, Southern Kermadec Ridge, 1235–1485.

Distribution. Kermadec Ridge seamounts (Fig. 226) and Tasmania, 1050–1485 m.

Habitat. Members of the genus *Sternostylus* seem to be commonly associated with large cnidarians, see discussion below for *S. rogeri*, and it can be expected that *S. niwa* **sp. nov.** is similarly host-associated. All specimens of *S. niwa* **sp. nov**. were from seamounts (Rumble III, Thompson, Lillie) and collected together with live stony corals or bamboo corals and sponges, although it is not known if there were specific associations.

Diagnosis. Carapace dorsally covered with prominent spines. Gastric region with strong spines in hexagonal arrangement, with central spine. Mid-cervical groove at about midlength of carapace. Sternite 4 surface with two pairs of spines or granules, anterior pair small, posterior pair distinct. Abdomen partly covered with spines; tergites 1 and 2 with anterior row of spines; tergites 3 and 4 unarmed or with lateral pair of spines only, near pleura; pleura furnished with some spines or granules; abdominal tergites and pleura 5 and 6 with strong spines. Antennal scale reduced. Mxp3 carpus extensor margin with small spines, distal spine distinct, propodus smooth. P2–4 propodi with articulated spines along entire flexor margin, at most a single fixed spine proximally; at most 4 × longer than dactyli.

Description. Carapace: Excluding rostrum, 1.1–1.2 × as long as its greatest width at posterior third.

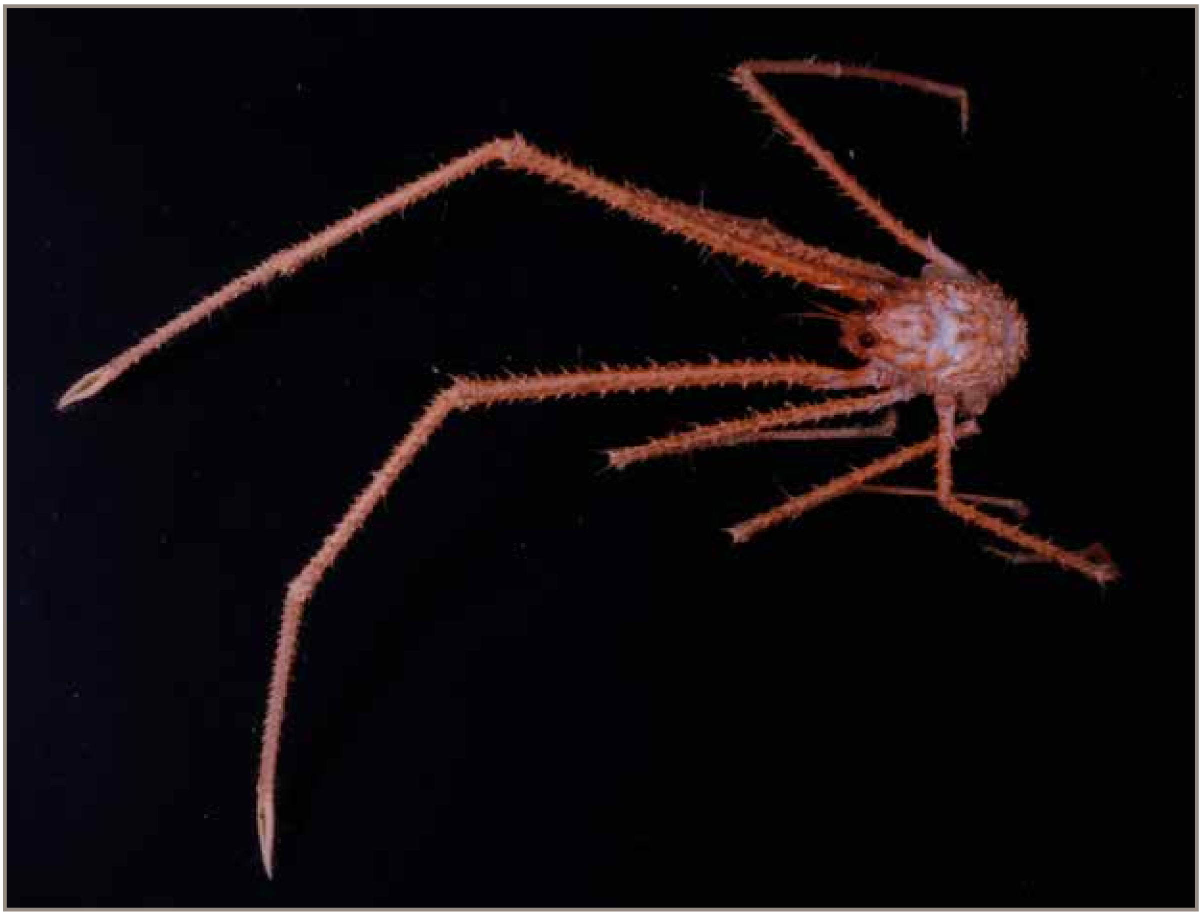


Figure 222. Live coloration of *Sternostylus niwa* **sp. nov.**, holotype female, pcl 13.6 mm, NIWA 72854, Stn TAN1104/122. Image courtesy of Rob Stewart, NIWA.

Dorsal surface covered with prominent spines across entire surface, more numerous on posterior half, especially on lateral portion. Cervical groove situated at about mid-length of carapace. Gastric region convex, distinctly separated from cardiac region by deep depression slightly anterior to midpoint of postorbital carapace length; six spines in hexagonal arrangement with another spine in center (additional spine situated posterior to median spine in holotype, absent in paratypes). Hepatic region smooth. Anterior branchial region separated by deep depression from posterior branchial region; large median spine situated in centre of anterior branchial region. Posterior branchial region with a few large spines, more numerous and slightly smaller in lateral portion. Cardiac region with 2 pairs of prominent median spines (1 anterior and 1 at midlength) and few smaller spines scattered in between and in lateral cardiac area. Lateral orbit rounded (not produced). Anterolateral spine distinct. Lateral margins diverging posteriorly; hepatic margin with or without small spine; large spine in anterior branchial region and large spine at anterior angle of posterior branchial margin, remainder of posterior branchial margin with numerous smaller spines. Posterior margin with pair of prominent median spines in addition to numerous small and large spines along entire margin. Rostrum 0.2–0.3 × pcl, rostral base laterally ridged, rostral spine curving dorsally. Pterygostomian flap with distinct spine at anterior margin, directed horizontally, lateral surface entirely covered with spines.

Thoracic sternum: Sternal plastron 1.3 × as wide as long. Sternite 3 with distinct pair of median spines on anterior surface. Sternite 4 with two large pairs of spines along anterolateral margin, about subequal in size; surface with 2 pairs of spines, anterior pair small or indistinct, posterior pair distinct.

Abdomen: Somite 1 with transverse row of large spines, interspersed with a few small spines and granules; pleura ending in sharp, strong spine. Somite 2 tergum with transverse anterior ridge with row of spines, laterally with distinct raised region bearing 1 or 2 spines; posterior surface irregular, without spines; pleura with a few spines and granules along margins and on surface. Somites 3 and 4 terga unarmed, lateral extremities inflated, with distinct or obsolete spine (distinct in holotype); pleura with a few scattered spines. Somite 5 tergum with surface smooth or with a few small spines on surface and posterior margin, laterally with 1 or 2 pairs of spines; pleura with a few scattered small spines or granules on surface and row of spines along posterior margin. Somite 6 with large spines, 2 pairs of submedian spines on distinct tergite,

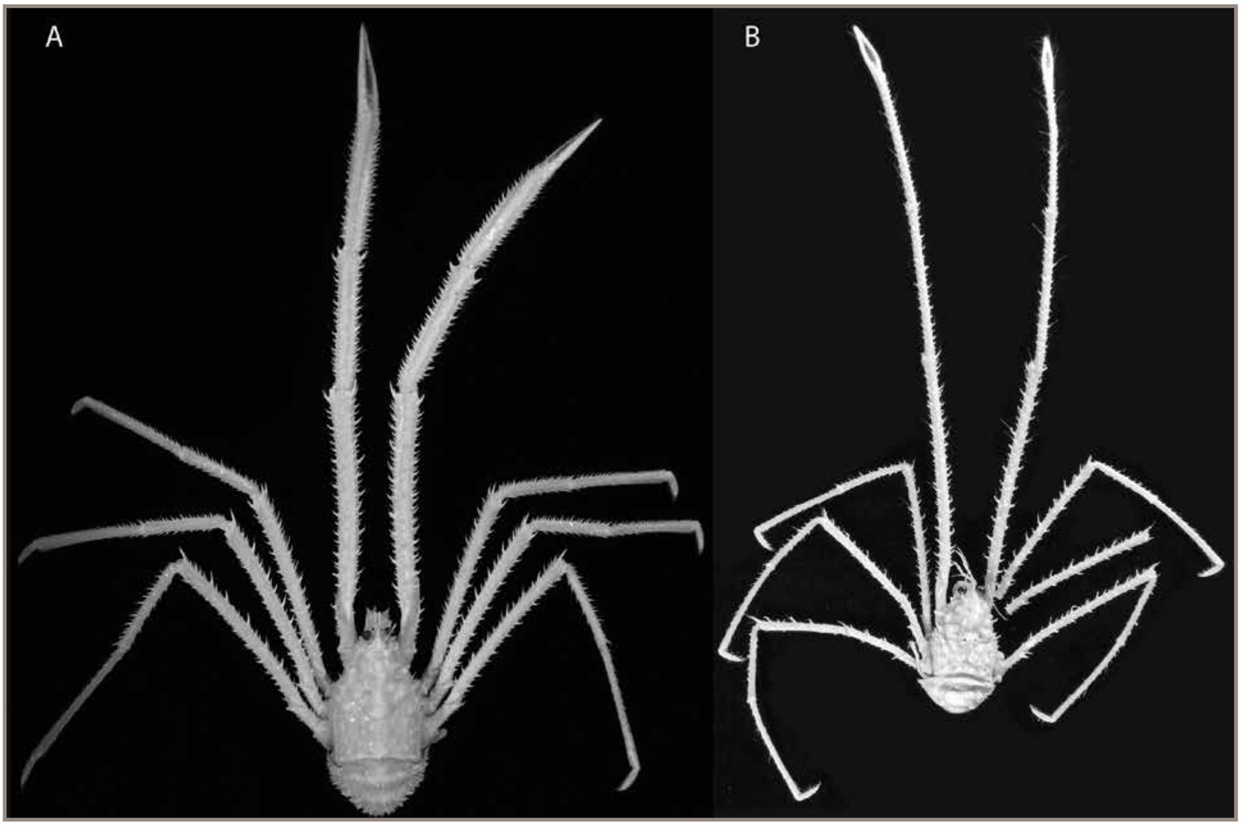


Figure 223. A. *Sternostylus rogeri* (Baba, 2000), male, pcl 27.8 mm, NIWA 14547; **B.** *S. niwa* **sp. nov.**, holotype female, pcl 13.6 mm, NIWA 72854.

posterior margin with 3 large spines. Telson consisting of two plates, laterally lobe-like; 1.1–1.2 × broader than long; posterior plate 1.1–1.3 × longer than anterior.

Eyes: Eyestalks not reaching rostral tip, 1.5–1.7 × longer than wide; cornea moderately dilated, 0.5 × length of eye stalk.

Antennal peduncle: Article 2 with acute distolateral spine; distal 2 articles with distoventral spine, usually distinct and slender, article 5 2.2 × as long as article 4; flagellum barely reaching end of Pl merus; antennal scale reduced.

Maxilliped 3: Endopod of Mxp3 relatively stout. Coxa with distinct ventral spine. Basis with 1 or 2 mesial spines; ischium with 10–14 large and subequal spines along entire length of cristata dentata. Merus with distolateral spine. Carpus with small distolateral and small proximal spine or granule on extensor margin. Propodus smooth along extensor margin.

Cheliped: Slender, length 8.4–8.8 × pcl, sparsely setose, bearing acute spines arranged in rows along entire length. Ischium with strong distodorsal and distoventral spines, with numerous spines along ventral and dorsal margins and scattered over lateral surface. Merus longer than carpus (ischium and merus combined 1.5–1.7 × carpus length), with 5 distal spines. Carpus subequal to palm in length, with 6 distal spines. Palm very slender, at least 10 × as as long as wide; a few small spines along proximal portion of fixed finger. Dactylus 0.4–0.5 × as long as palm; with small spines or granules along proximal portion; occlusal margins gaping, with dense stiff setae and at least 1 pronounced process proximally on both fixed and movable finger.

Pereopods 2–4: Slender, subcylindrical, with rows of spines along entire length, with sparse coarse setae. Merus about twice as long as carpus. Carpus 0.7–0.8 shorter than propodus. Propodus with spines along the proximal ¾ of the extensor margin; 1 and 2 rows of spines along mesial and lateral margins, respectively; flexor margin with basally articulated spines along entire length (14–22 on P2, 14–20 on P3, 13–15 on P4), distalmost paired, proximal-most spine fixed or articulated. Dactyli short, about 0.3 × length of propodi, flexor margin nearly straight, ending in strong, curved corneous spine preceded by 8–10 sharp inclined spines along entire length, successively diminishing in size proximally.

Colour in life. Pale orange base colour, darker on walking legs and proximal portions of chelipeds. Anterior portion of carapace and ocular peduncles dark orange, elevated parts (spines, cardiac region) of carapace and abdomen darker orange against much lighter base colour (Fig. 222).

Etymology. Named after the funding organisation and the author's employer, the National Institute of Water & Atmospheric Research (NIWA). Used as noun in apposition.

Remarks. Four specimens from the lower Kermadec Ridge are clearly different from the other

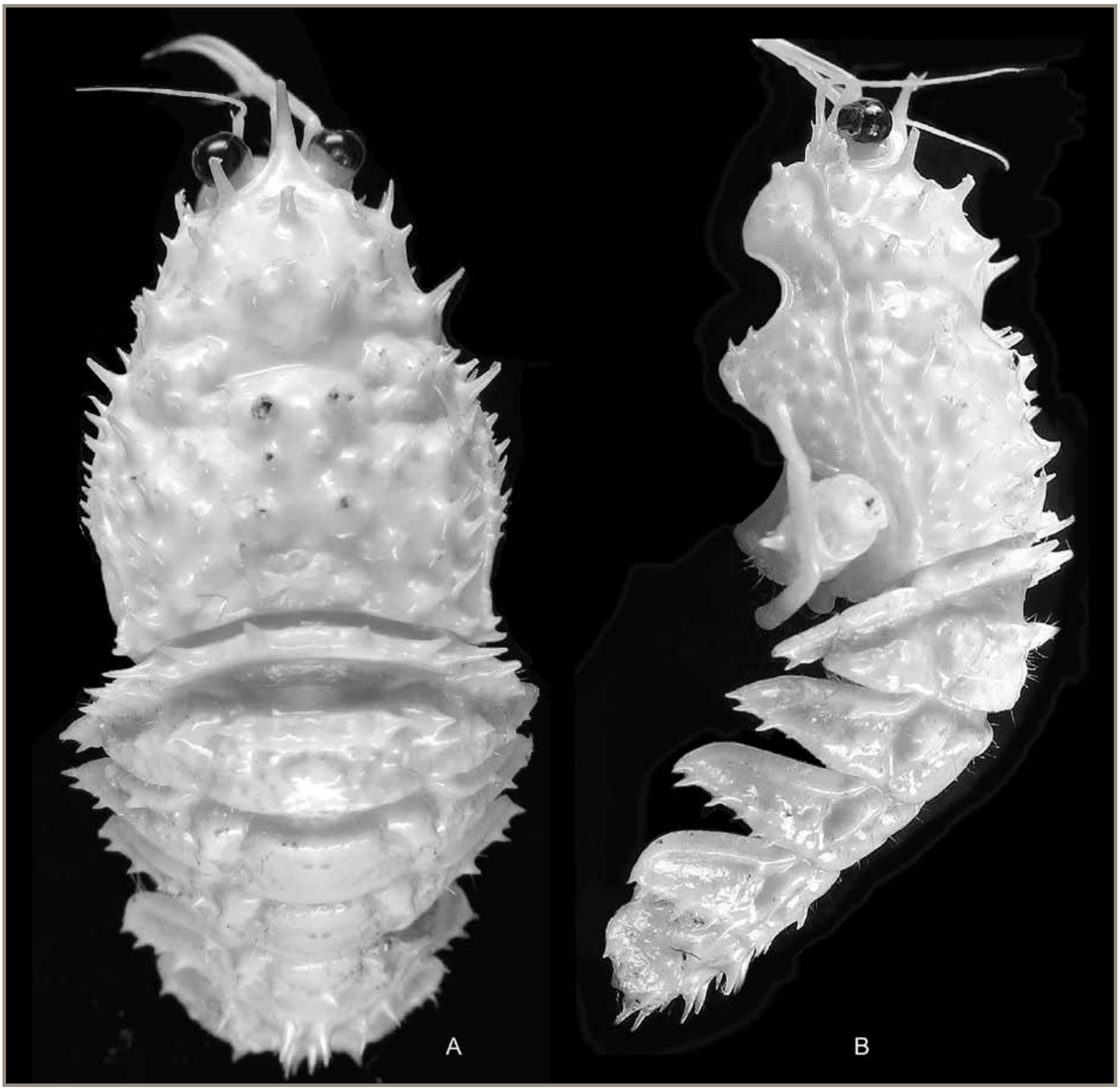


Figure 224. *Sternostylus niwa* **sp. nov.**, holotype female, pcl 13.6 mm, NIWA 72854: **A.** carapace and abdomen, dorsal; **B.** carapace and abdomen, lateral.

New Zealand species, *Sternostylus rogeri*, and are named herein as *Sternostylus niwa* **sp. nov.** Slight variation between the specimens examined of *S. niwa* **sp. nov.** is noted for the following:

- the female holotype bears an additional spine in the proximal portion of the gastric hexagonal arrangement (Fig. 224); the other specimens do not have any additional spines within this area;
- antennal article 4 bears a spine ranging from distinct (holotype, Fig. 225D) to minute (NIWA 65042);
- the surface of sternite 4 bears two pairs of spines in all four specimens; the posterior pair is always prominent, and the anterior pair varies from minute (NIWA 72881) to small but distinct (holotype and NIWA 72923, Fig. 225B);
- the abdominal spination of the paratypes is slightly less pronounced than in the holotype with the lateral extremities of tergite 3–4 inflated and raised, without a distinct spine. The overall distribution of spines with a row of strong spines on anterior portions of tergites 1 or 2 and the surfaces of tergites 3–4 smooth is consistent in all (Fig. 225A);
- the propodal flexor margin of P2–4 bears articulated spines along the nearly entire length. The proximal-most spine is either fixed or articulated. In the holotype, it is fixed in two of the five legs; in the male paratype (NIWA 72923) all propodi have a fixed proximal spine and in the female paratype (NIWA 65042) all spines are articulated (Fig. 225H).

Two ovigerous females from Tasmania, reported by Ahyong & Poore (2004) as *Gastroptychus hendersoni* (Alcock & Anderson, 1899), were kindly loaned by Rachael King from the South Australian Museum (SAM). Close examination of the Tasmanian specimens

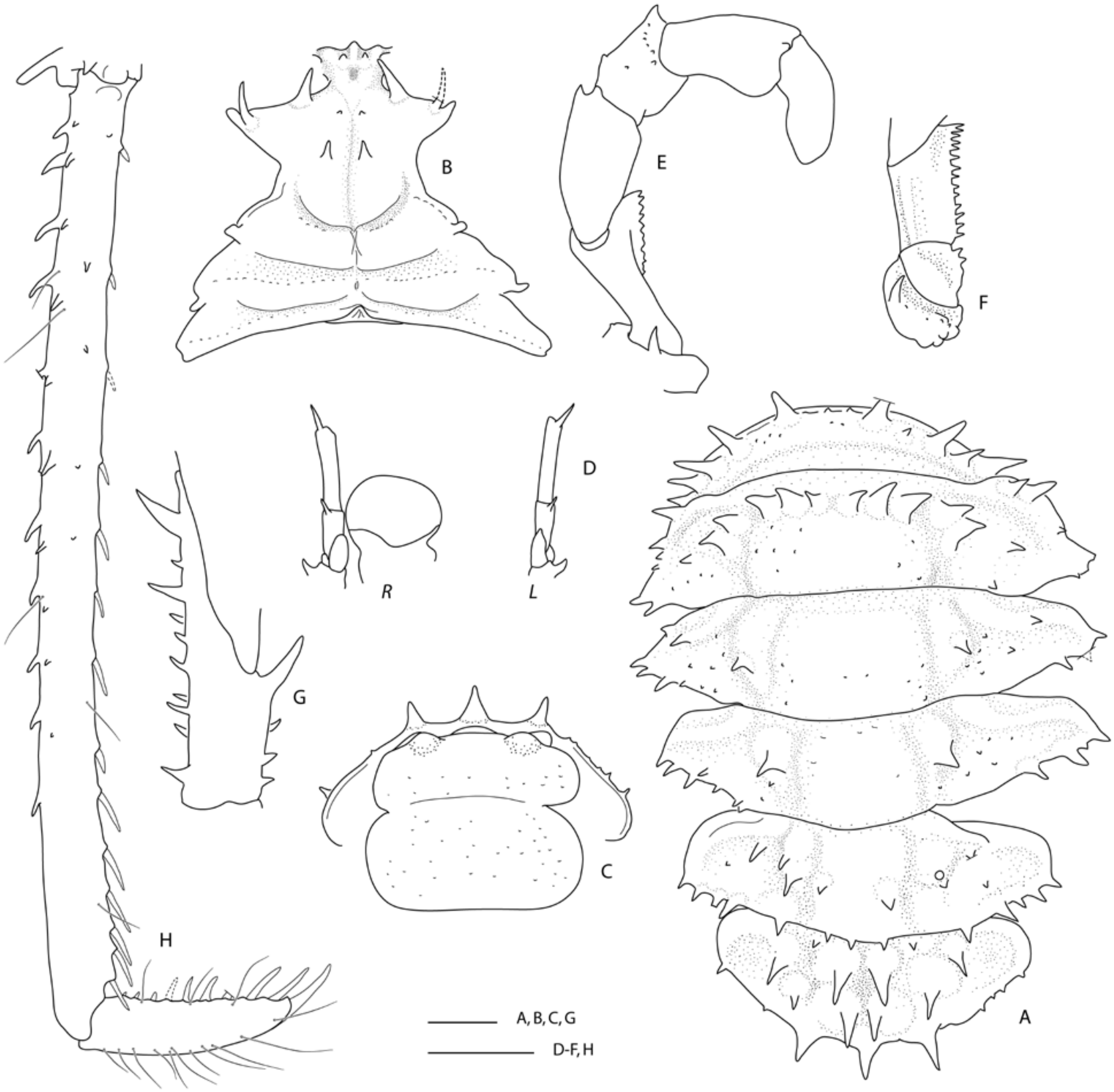
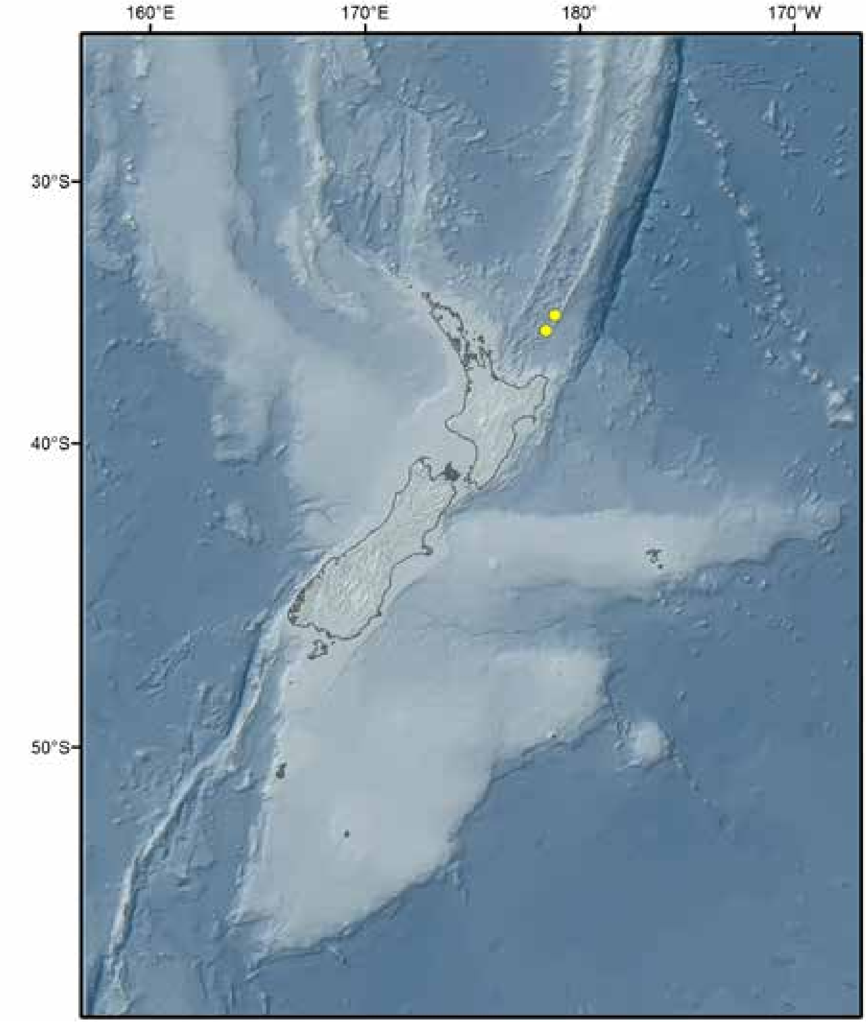


Figure 225. *Sternostylus niwa* **sp. nov.**, holotype female, pcl 13.6 mm, NIWA 72854: **A.** abdomen, extended, dorsal; **B.** sternum, ventral; **C.** abdominal somite 6 and telson; **D.** antennae, right and left, right ocular peduncle, ventral; **E.** Mxp3 endopod, right, ventral; **F.** coxa, basis and ischium of right Mxp3, ventral; **G.** cheliped ischium, right, mesial; **H.** dactylus, propodus and distal carpus of P2, lateral. Scale = 2 mm.

indicates that they most likely belong to *S. niwa* **sp. nov.**, see discussion of the differences from *S. hendersoni* below. These two specimens not only significantly extend the distribution, but also the documented size range. The New Zealand specimens have a pcl of 12–14 mm, while the Tasmanian specimens are much larger at 24.0 and 30.6 mm pcl. Some variation from the New Zealand material includes the presence or absence of a small hepatic spine posterior to the anterolateral spine; the sternite 4 surface bears an additional pair of small spines (large female) and a few scattered granules (smaller female); the cheliped is more massive (the length is 6.2–7.0 × pcl compared to 8.4–8.8 × pcl in the New Zealand specimens); and the P2–4 propodi have up to three small fixed spines proximally along the flexor margin (the smaller NIWA specimens have at most one fixed spine). Unfortunately, the SAM specimens were preserved in formalin, so DNA sequence data are not available. Most of these differences are consistent with allometric changes and it is hoped that more material from across the geographic and size ranges will be collected in the future to permit a more complete documentation of the species.

Sternostylus niwa **sp. nov.** is closely allied with those species that only have a few spines present on the abdominal tergites (not entirely covered with spines as in *S. rogeri*, see below), although the abdominal pleura bear some spines, compared to smooth pleura in *S. formosus* (Filhol, 1884), *S. iaspis* (Baba & Haig, 1990), and *S. investigatoris* (Alcock & Anderson, 1899); the carapace with prominent spines and only a few smaller scattered spines, not with numerous small scattered

Figure 226. Distribution of *Sternostylus niwa* **sp. nov.** around New Zealand.



spines as in *S. cavimurus* (Baba, 1977b), *S. salvadori* (Rice & Miller, 1991) or *S. perarmatus* (Haig, 1968); and with those spines in the gastric region arranged in the typical hexagon bearing a central spine. *Sternostylus niwa* **sp. nov.** shares these features with *S. defensus* (Benedict, 1902) and *S. hendersoni* (Alcock & Anderson, 1899). *Sternostylus defensus* is only known from the Galapagos Islands; the two syntypes collected in 1888 are around the same size as *S. niwa* **sp. nov**. (the male pcl is 12.9 mm, the female 8.7 mm, (Baba 1990)), but a much larger male (pcl 23.9 mm) has recently been collected close to the type locality on East Wolf Seamount, north of the Galapagos Islands (Baba & Wicksten 2019). *Sternostylus defensus* differs from *S. niwa* **sp. nov.** in a slightly more slender carapace (pcl 1.1–1.2 × width, compared to 1.3×); differences in spination are the distinct pair of spines on the surface of sternite 3 in *S. niwa* **sp. nov**. (versus a smooth surface) and the distinct spines along the posterolateral margins of abdominal pleura 2–6 (versus smooth, confirmed by K. Baba and M. K. Wicksten).

Sternostylus hendersoni (Alcock & Anderson, 1899), originally described from the eastern Arabian Sea, is supposedly widely distributed in the Indo-West Pacific. It has been reported from the southwestern Pacific by Baba (1991) from New Caledonia and Ahyong & Poore (2004) from Tasmania (the latter is provisionally referred to *S. niwa* **sp. nov.** here). There are some contradictions between the original description by Alcock & Anderson's (1899) and subsequent reports that require reconciliation, e.g. the original description clearly states that all abdominal tergites and pleura bear spines, but in most recent keys (Baba 1988 and Baba 2005) and the recent accounts by Ahyong & Poore (2004) and Baba (1991) the tergites, at least of abdominal segments 3 and 4 are listed as unarmed. Alcock & Anderson's (1899: pl. 45, fig. 2) illustration of the syntype dorsal habitus match the description in having two rows of carinae on the abdominal tergite 2 and "two transverse series of spines" on tergites 4 and 5 (Alcock & Anderson 1899: 23). This differs from *S. niwa* **sp. nov.**, which only has one anterior row of spines on the second tergite, at most a pair of spines on the lateral margins of tergite 4 and a few scattered spines on tergite 5 which are not arranged in apparent rows in any of the specimens examined. Secondly, Alcock & Anderson (1899) state that the Mxps are unarmed, but Tirmizi (1964) illustrates a Mxp3 with spines on both the merus and carpus for a specimen from the southern Arabian coast collected by the John Murray expedition in 1933–34. Subsequent accounts do not mention the Mxp3 armature, but the New

Zealand specimens are more similar to Tirmizi's (1964) account than the original description, with a dorsodistal spine on the merus, a small proximal and a prominent dorsodistal spine on the carpus. Furthermore, Alcock & Anderson (1899: 24) mention the relative proportions of the walking legs with the last walking leg (P4) being the longest "owing to the elongation of their propodite" and the propodus being 5 × as long as the dactylus. This was used to distinguish between *Ptychogaster hendersoni* and *P. investigatoris,* with the latter having the first walking leg (P2) the longest and the dactyli "hardly more than a quarter the length of the propodites". In *S. niwa* **sp. nov**., P4 is the longest with the propodus 1.1–1.2 × longer than P2 propodus; but the propodi are at most 4 × longer than the dactyli (3.1–4.0 from P2–4 in the holotype, 3.4–4.0 in all remaining specimens). A diagnostic character for *S. hendersoni* proposed by Alcock & Anderson (1899) is the relative proportion of the anterior and posterior telson plates, with the anterior being "not much more than half the length of" the posterior in the type. In the material examined here, the proportion ranges from 0.5 to 0.7, with no apparent relationship to size of the specimen overall. A re-examination and full illustration of the types of *S. hendersoni* is required, but all of the Alcock & Anderson (1899) material from the *Investigator* voyage is currently housed in the Zoological Survey of India, Calcutta, which has been inaccessible by all accounts.

Sternostylus niwa **sp. nov.** is easily distinguished from *S. rogeri*, the only congener in the New Zealand region, by the abdominal tergites 3–4 that are nearly entirely smooth (versus densely spinose); the propodus of Mxp3 being smooth (versus with spines); and the P2–4 propodi flexor margin bearing at most a single fixed spine proximally (versus 2–6). *Sternostylus rogeri* and *S. niwa* **sp. nov**. so far also show a different depth distribution, the former having been collected at 600–1200 m depth, and the latter from deeper than 1200 m to possibly over 1400 m depth, at least in New Zealand. The two specimens here tentatively considered to be *S. niwa* **sp. nov**. from Tasmania were collected at 1050–1170 m.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 2.1% (two specimens, holotype NIWA 72854, paratype NIWA 72923). Interspecific sequence divergences: 13.8–14.2% [*S. rogeri*, two specimens, NIWA 14598, Genbank KF051394, Roterman *et al.* (2013)], 12.5–13% (*S. formosus*, Genbank KF051393, Roterman *et al.* (2013)].

ZooBank registration. *Sternostylus niwa* Schnabel, 2020 is registered in ZooBank under urn:lsid:zoobank.org:act:DDC6FB2C-A313-48A0-A68B-59C51233D1AE.

Sternostylus rogeri (Baba, 2000)

Figs 223A, 227–231, Seafloor Images 13–16

'Football jersey squat lobster', O'Shea *et al.* 1999: 51, fig. 28.

Gastroptychus rogeri Baba, 2000: 246, figs 1, 2; Davie 2002: 31 (no record); Poore 2004: 221, fig. 60b (compilation); Ahyong & Poore 2004: 8; Baba 2005: 21, figs 3c, d, 214 (synonymies, key); Baba *et al.* 2008: 24 (list and synonymies); Schnabel 2009b: 25 (list); Webber *et al.* 2010: 225 (list); Poore *et al.* 2011: 327, pl. 5C; Yaldwyn & Webber 2011: 207 (list); Roterman *et al.* 2013: 4, fig. 3 (phylogeny).

Gastroptychus spp., Ahyong *et al.* 2011b: 168, fig., colour photo, whole animal.

Type & locality (not examined). Holotype—TMAG G3497, 43°50′S, 147°E, 1000 m, Pedra Branca, southern Tasmania, 1000 m, male (pcl 27.9 mm).

Material examined. *Challenger Plateau (International Waters)*: NIWA 14555, Stn Z9844, 35°59.70′S, 166°0.70′E, 932 m, 18 Jun 1999, 1 male (30.0 mm, pcl 22.4 mm); NIWA 14557, Stn Z9719, 37°18.01′S, 166°45.08′E, 1200 m, 1 Mar 1999, 1 female (28.3 mm, pcl 22.9 mm); NMNZ CR.015242, SOP Stn OBS605/92, 36°12′S, 165°15′E, 1015–1026 m, 9 May 1993, 1 female ov. (24.7 mm, pcl 20.3 mm); NMNZ CR.015239, SOP Stn OBS1403/29, 37°13′S, 167°57′E, 987–1095 m, 27 Sep 2000, 1 male (30.8 mm, pcl 23.8 mm).

Southern Kermadec Ridge and Bay of Plenty: NIWA 72399, NIWA Stn TAN1104/37, 35°20.98–21.11′S, 178°32.50–32.38′E, Rumble II West Seamount, 1197–1297 m, 8 Mar 2011, 1 (badly damaged); NIWA 14547, Stn Z8482, 35°58.00′S, 176°49.00′E, 750, 28 Apr 1996, 1 male (33.3. mm, pcl 27.8 mm), 1 female (rostrum broken, pcl 18.1 mm); NMNZ CR.015237, NMNZ Stn ZM01 tow 24, 35°3.20′S, 177°28.8′E, 2 females ov. (35.2, 33.4 mm, pcl 28.3, 27.2 mm); NIWA 14600, Stn Z8292, 36°24.00–23.8′S, 176°56.76–56.65′E, 940–1175, 17 Jun 1995, 1 female ov. (37.2 mm, 29.6 mm); NIWA 14558, Stn Z8882, 37°1.00′S, 176°43.10′E, Waioeka Knoll, 976, 01 Aug 1997, 1 female ov. (31.7 mm, pcl 23.8 mm); NIWA 14556, Stn Z9780, 37°3.10′S, 176°42.60′E, 927, 25 Jun 1999, 1 male (42.1 mm, pcl 30.6 mm); NIWA 9005, NIWA Stn TAN0413/63, 37°13.45–13.17′S, 177°14.05–14.26′E, 693–698, 11 Nov 2004, 1 male (15.6 mm, 11.4 mm).

Northeast of Gisbourne: NMNZ CR.025198, 38°29′S, 178°53′E, 886–872 m, 11 Jun 1985, 1 male (40.0 mm, pcl 29.9 mm); NMNZ CR.025197, BS560 42°35′S, 173°41′E, 640 m, 28 Sep 1976, 1 female (13.4 mm, pcl 10.4 mm); NMNZ CR.016843, SOP Stn OBS2162/142, 44°53′S, 174°32′E, 820–850 m, 30 Nov 2005, 1 female ov. (31.0 mm, pcl 24.6 mm).

Hikurangi Margin: NIWA 23359, Stn Z10168, 39°28.56′S, 178°25.29′E, 874, 03 Jun 1999, 1 male (30.9 mm, pcl 22.3 mm).

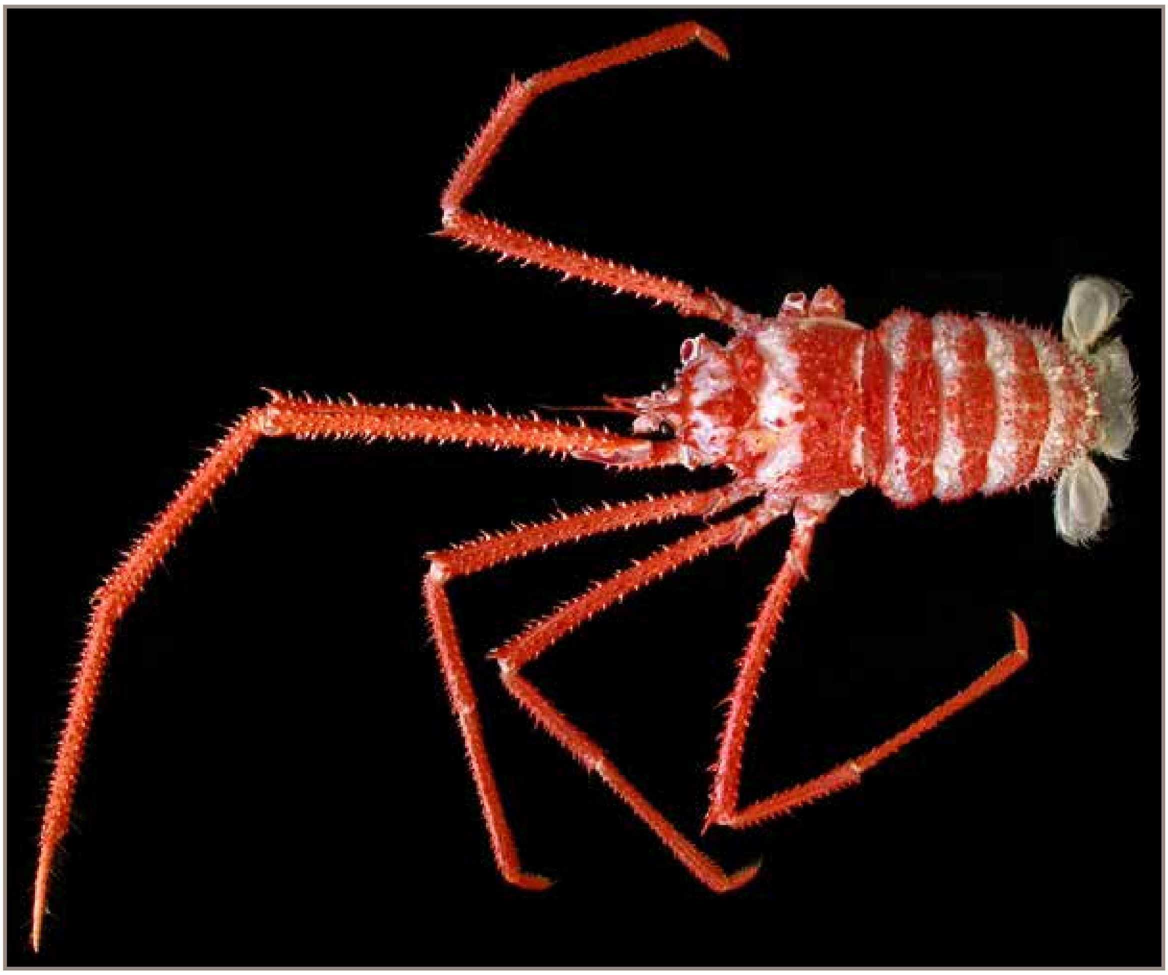


Figure 227. Live coloration of *Sternostylus rogeri* (Baba, 2000), female ov., pcl 30.7 mm, NIWA 44799, SOP Stn TRIP2494/19. Image courtesy of Shane Ahyong (AM).

Chatham Rise: NIWA 26449, NIWA Stn TAN0604/9, 42°45.76–45.45′S, 179°55.51–55.36′W, Zombie Seamount, 1019–1081, 28 May 2006, 1 male (12.3 mm, pcl 9.8 mm; sequenced, see Fig. 5); NIWA 81202, SOP Stn TRIP2714/157, 44°**28**′S, 178°36′W, 702–904, 26 Nov 2008, 1 male (22.0 mm, pcl 18.3 mm); NIWA 14598, Stn Z15060, 44°29.40–30.3′S, 175°5.80–5.50′W, 604–831, 12 Feb 2003, 1 female ov. (40.4 mm, pcl 32.0 mm; sequenced, see Fig. 5); NIWA 10885, Stn Z10920, 44°44.10′S, 176°48.82′W, 753, 01 Nov 2001, 1 male (13.3 mm, pcl 10.2 mm); AKM MA94006, 44°42′S, 176°20′W, 675–963 m, 15 Feb 1995, 1 male (34.5 mm, pcl 26.8 mm); MNZ CR.012062, 800–900 m, April 1994, 1 male (28.5 mm, pcl 21.0 mm); NMNZ CR.015132, NIWA Stn TAN9208/25, 46°59.05′S, 165°57.20′E, 810–1200 m, 22 Aug 1992, 1 male (33.6, pcl 26.7 mm); NMNZ CR.015241, NMNZ Stn WIL9101/96, 47°20.50′S, 165°48.64′E, 917–1097 m, 17 Jul 1991, 1 female ov. (20.5 mm, pcl 15.8 mm); NMNZ CR.015238, NMNZ Stn WIL9101/86, 47°59.52′S, 165°8.56′E, 868–1132 mm, 15 Jul 1991, 1 female (rostrum broken, pcl 22.2 mm); NMNZ CR.015236, NMNZ Stn WIL9101/36, 50°59.64′S, 164°30.30′E, 940–1062 m, 1 female ov. (28.6 mm, pcl 22.8 mm); NMNZ CR.021716, SOP Stn OBS2385/33, 44°40′S, 176°23′E, 1090 m, 5 Mar 2007, 1 female ov. (29.6 mm, pcl 24.5 mm).

Subantarctic New Zealand Region, *Bounty Plateau*: NIWA 44799, SOP Stn TRIP2494/19, 47°27′S, 176°57′E, 745–790, 03 Sep 2007, 1 female ov. (36.0 mm, pcl 30.7 mm); NIWA 45881, SOP Stn TRIP2320/116, 47°40′S, 175°16′E, 818–890, 05 Nov 2006, 1 male (rostrum broken, pcl 26.1 mm).

Subantarctic New Zealand Region, *Solander Trough*: NIWA 14637, Stn Z15063, 48°1.00–1.2′S, 166°4.00–4.70′E, 939–1116, 04 Nov 2002, 1 female ov. (24.5 mm, 19.4 mm); NIWA 14548, Stn Z9583, 48°2.01′S, 166°6.01′E, 935, 25 Nov 1998, 1 female ov. (24.5 mm, pcl 19.4mm); NIWA 14552, Stn Z9583, 48°2.01′S, 166°6.01′E, 935, 25 Nov 1998, 1 female (19.9 mm, pcl 14.9); NIWA 14554, Stn Z9583, 48°2.01′S, 166°6.01′E, 935, 25 Nov 1998, 1 male (26.8 mm, pcl 22.6 mm); NIWA 14553, Stn Z10222, 50°11.80′S, 165°49.30′E, 1090–1172, 18 Nov 1999, 2 females ov. (30.0 mm, broken rostrum, pcl 26, 21.8 mm).

Tasmania (Australian EEZ): NIWA 14597, FRV *Southern Surveyor* Stn SS0197/14, 44°16.80–17.4′S, 147°16.20–12.60′E, Sister I Seamount, 1000 m, 23 Jan 1997, 1 male (27.1 mm, pcl 21.1 mm);

Tasman Sea (International Waters): NIWA 14599,

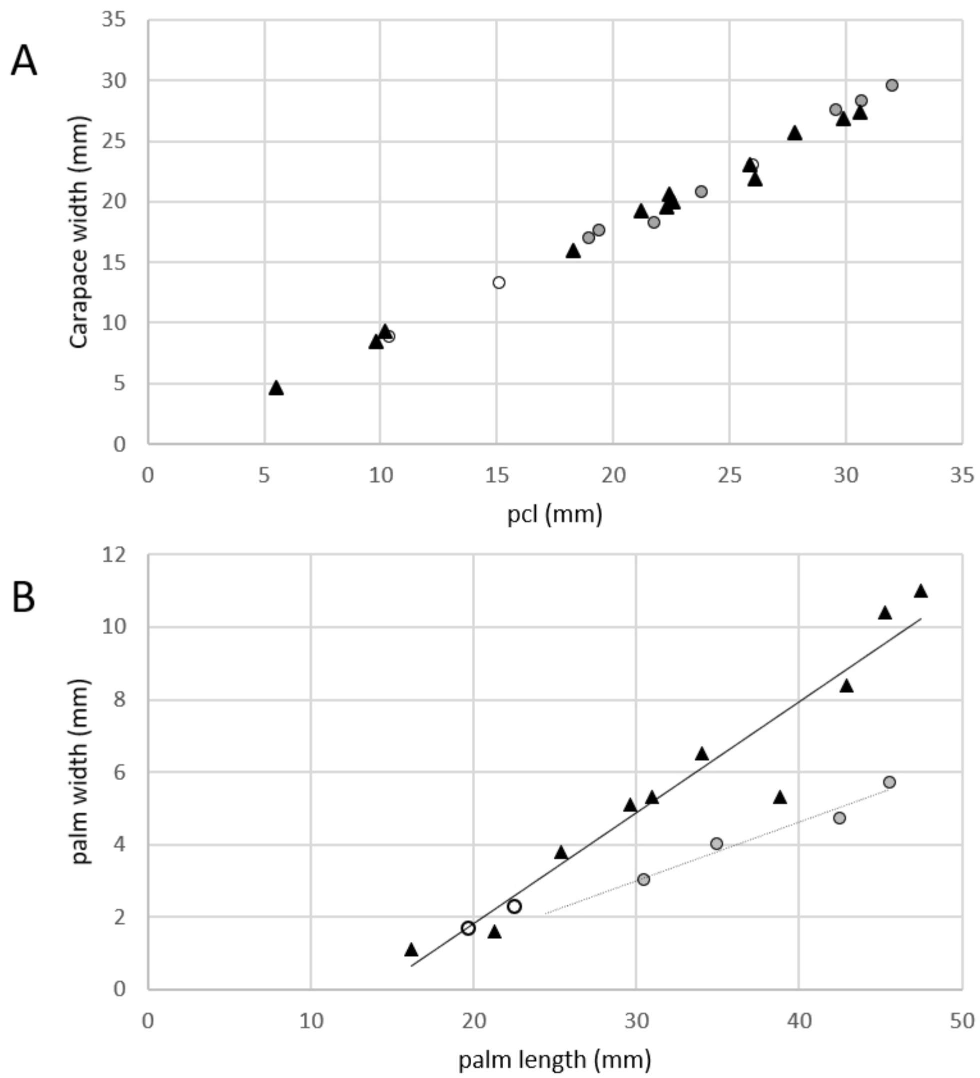


Figure 228. Meristic comparison of *Sternostylus rogeri* (Baba, 2000) for males (black triangles), females (white circles) and ovigerous females (grey circles): **A.** carapace width relative to post-orbital carapace length (pcl) in mm; **B.** cheliped palm width relative to palm length, including trend lines for males (solid black line) and ovigerous females (broken line).

Stn Z15058, 47°9.20, 8.9′S, 148°44.10, 27.10′E, 922–1074, 28 Jul 2000, 1 female (25.0 mm, pcl 21.4 mm); NIWA 14551, Stn Z9393, 47°27.02′S, 148°52.02′E, 1100 m, 09 Oct 1998, 1 male (33.0 mm, pcl 25.7 mm); NIWA 14549, Stn Z9339, 47°27.03′S, 148°52.05′E, 1019 m, 14 Sep 1998, 1 male (25.2 mm, pcl 21.2 mm).

No location information: NIWA 24571, Stn AMA0501/11, 1 male (7.6 mm, pcl 5.5 mm); NMNZ CR.015256, NMNZ Stn WIL9101, 1 male (25.3 mm, pcl 20.4 mm); NMNZ CR.015240, 1 female ov. (34.1 mm, pcl 28.5 mm); NMNZ CR.012060, 1 female ov. (34.0 mm, pcl 25.3 mm); NMNZ CR.012061, 1 female ov. (33.7 mm, pcl 26.4 mm); NMNZ CR.012063, 1 male (28.0 mm, pcl 21.5 mm); NMNZ CR.022000, SOP Stn OBS2162/19, 1 male (31.8 mm, pcl 27.0 mm); NMNZ CR.021997, SOP Stn OBS2162/12, 1 female ov. (29.6 mm, pcl 24.5 mm), 1 male (31.4 mm, pcl 26.0 mm).

Distribution. Tasmania, New South Wales, 476–1000 m; southern Lord Howe Rise, Bay of Plenty and lower Kermadec Ridge, Hikurangi Margin, Chatham Rise, Bounty Plateau, Solander Trough, 604–1297 m.

Habitat. *Sternostylus rogeri* (Baba, 2000) is widespread around the region, occurring along nearly the entire continental margin from 35°S southward to south of 50°S off the Auckland Islands; it is usually found along the upper to mid continental margins and seamounts with an average depth of 937 m (Fig. 231). It was usually collected with anthozoans such as black corals, gorgonian, and hard corals, and specimens have been observed perched on large corals (Seafloor Images 13–16). Three large *Sternostylus*, most likely *S. rogeri*, observed during towed-camera dives, were perched on large corals *Paragorgia* sp., *Leiopathes* sp. and a large bushy black coral (? *Triadopathes* sp.). See comments on biological associations in this genus above.

Diagnosis. Carapace dorsally covered with prominent spines; gastric region with strong spines in hexagonal arrangement, with central spine; cardiac and branchial regions with a few large spines interspersed with many small spines. Mid-cervical groove at about

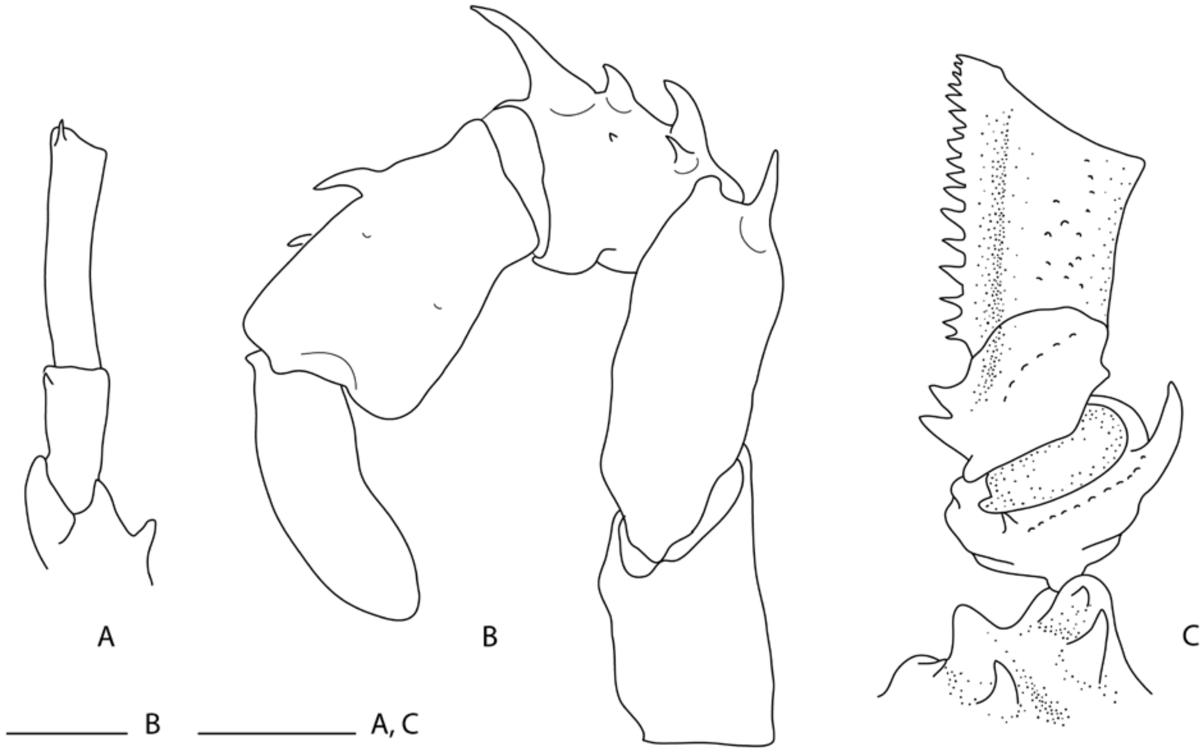


Figure 229. *Sternostylus rogeri* (Baba, 2000), male, NIWA 14558: **A.** antenna, left, ventral; **B.** endopod of Mxp3, left, lateral, setae omitted; **C.** sternite 3, coxa, basis and ischium of Mxp3 showing crista dentata, left. Scale bars = 2 mm.

midlength of carapace. Sternite 4 surface with 2 pairs of spines or granules, anterior pair small, posterior pair distinct. Mxps 3 carpus extensor margin with distinct spines, distal spine large, propodus with distinct spines on extensor margin. Abdomen entirely covered with spines, not arranged in apparent rows. Antennal scale reduced. P2–4 propodi flexor margin with 2–6 fixed spine on proximal portion, followed by articulated spines along remaining length.

Colour in life. This species is commonly called the 'football crab' by local fishermen since its striped body coloration is reminiscent of rugby jerseys (Fig. 227, Seafloor Images 13–16). The live coloration is usually deep red with either distinct white transverse stripes along the carapace and the abdomen or with more diffuse lighter coloration in the excavated portions in smaller specimens (along the cervical grove and the anterior and posterior portions of the abdominal segments). The legs are all uniformly orange or red (Fig. 227).

Remarks. Four lots of *Sternostylus rogeri* deposited at NIWA were collected from southern Tasmania (NIWA 14549, 14551, 14597, 14599). Of these, NIWA 14597 was collected very close to the type locality (Baba 2000) and three of these are sufficiently intact to be compared to the New Zealand material.

Sternostylus rogeri is the largest squat lobster in New Zealand waters, the largest specimen measuring 42.1 mm carapace length and 28 cm from the tip of the cheliped to the end of the telson (NIWA 14556). It is a distinctive species and the diagnostic spination and proportions appear to be constant.

The overall body size of males and females does not differ sufficiently to indicate any clear sexual dimorphism: males ranged from 7.6 to 42.1 mm cl (5.5–30.6 mm pcl) and females ranged from 13.4 to 40.4 mm cl (10.4–32 mm pcl) (Fig. 228A). It appears that males may have a slightly longer rostrum (0.2–0.4 × pcl) than the females (0.2–0.3 × pcl). However, there is distinct sex and size-related variation in the size of the cheliped and the palm of the cheliped. Smaller specimens generally have comparably longer chelipeds compared to larger specimens, and males usually have longer chelipeds and more massive palms than females: the total cheliped length is 4.3–8.2 × pcl in males and 4.5–7.4 × pcl in females. The cheliped palm length-width ratio is between 4.3 (largest specimen) and 14.5 (smallest specimen) in males and between 5.8 and 15.4 in large and small female specimens, respectively (Fig. 228B illustrates the difference in palm length and width for males and females). The type species (Baba 2000) includes a note that the cheliped merus and carpus are equally wide but narrower than the palm. This applies to large specimens, particularly large males, but in small specimens, the entire cheliped is slender and the palm width is subequal to both the merus and carpus.

Sternostylus rogeri is easily recognised by the overall spiny appearance, including the abdomen being

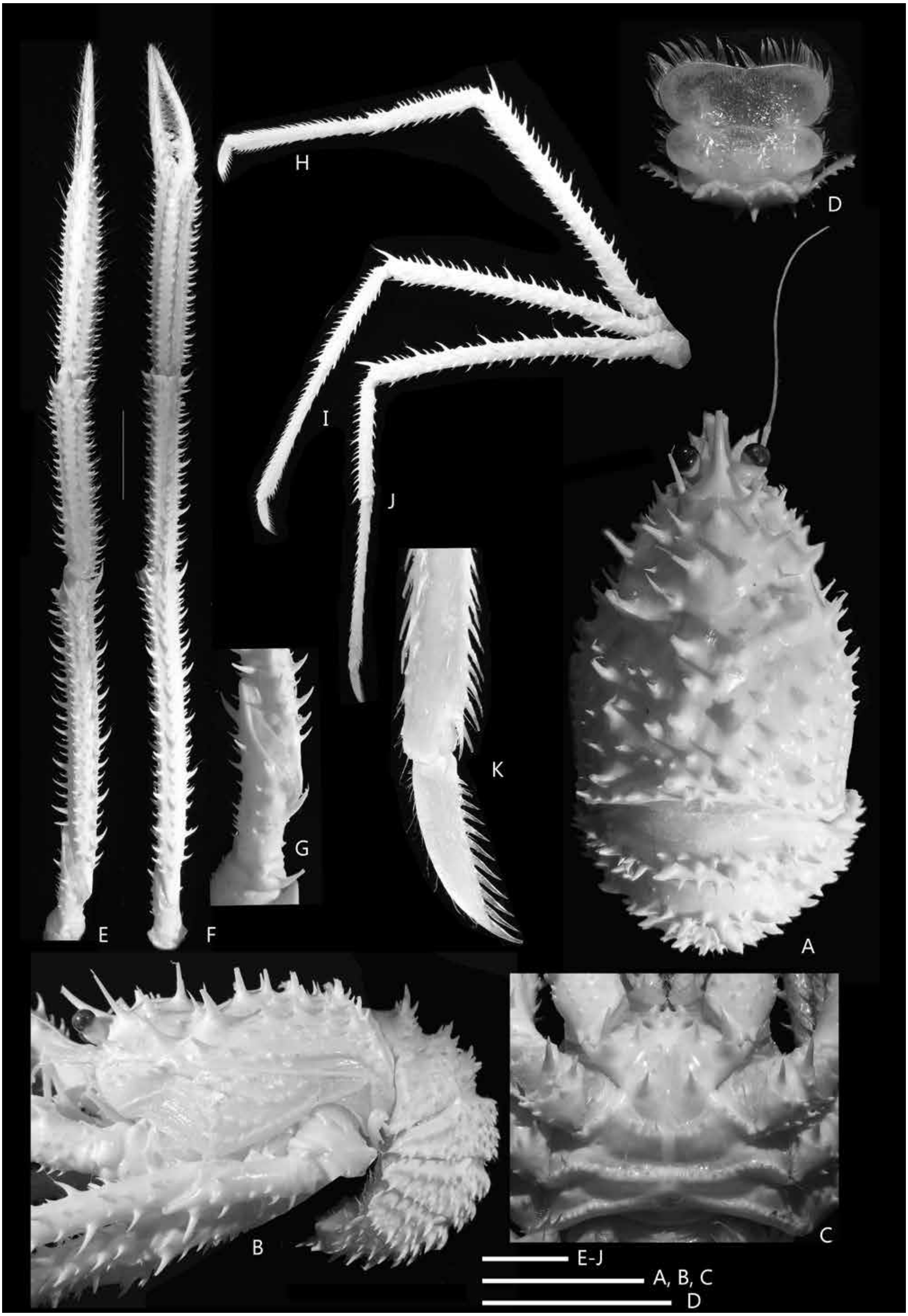


Figure 230. *Sternostylus rogeri* (Baba, 2000), male, NIWA 14547: **A.** carapace and abdomen dorsal; **B.** habitus, lateral; **C.** sternal plastron and distal parts of pereopods; **D.** telson and posterior portion of abdominal somite 6; **E.** left cheliped, mesial; **F.** left cheliped,dorsal; **G.** right cheliped ischium and proximal merus, mesial; **H–J.** left P2–4, **K.** dactylus and distal portion of propodus of right pereopod 2, lateral. Scale bars = 2 mm.

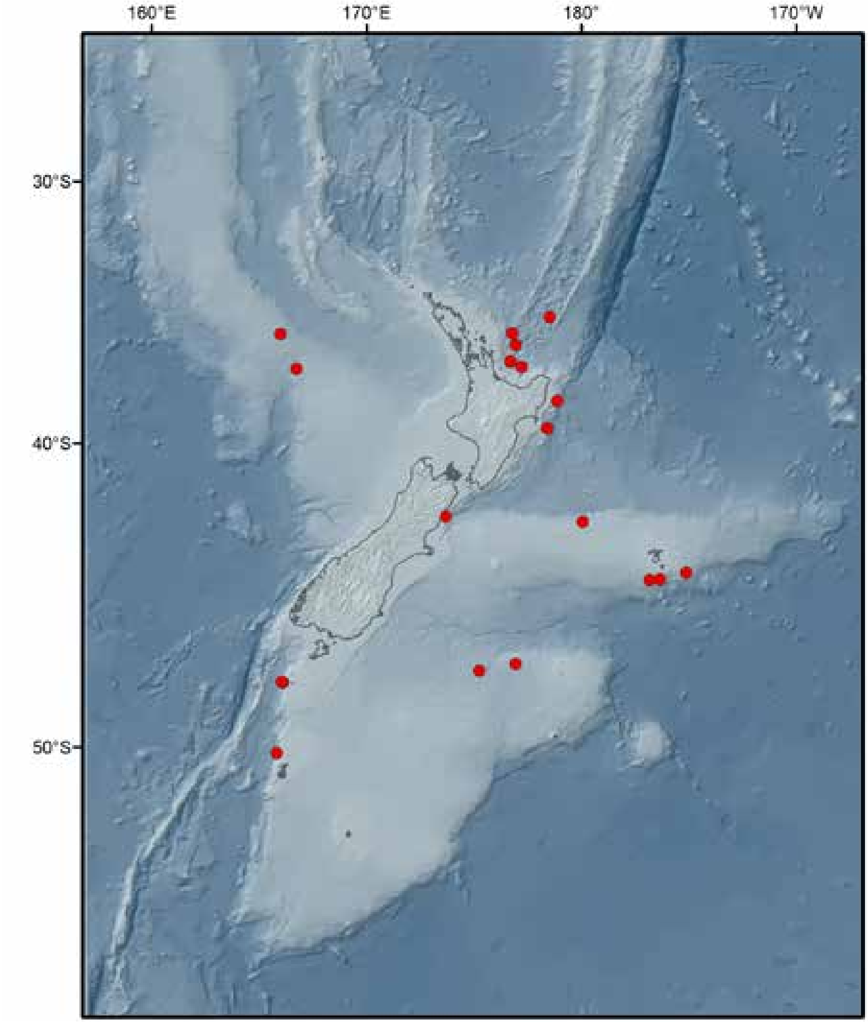


Figure 231. Distribution of *Sternostylus rogeri* (Baba, 2000) around New Zealand.

entirely covered with small spines, which is the primary character that distinguishes it from its New Zealand congener *S. niwa* **sp. nov.**, discussed under that species above. Other species that share the entirely spinose abdomen are *S. cavimurus* (Baba, 1977b) from the west coast of South America, *S. hawaiiensis* (Baba, 1977a) from Hawaii, and *S. milneedwardsi* (Henderson, 1885) from Chile. *Sternostylus cavimurus* differs from the other three including *S. rogeri* in having an indistinct hexagonal arrangement of spines on the gastric region (versus distinct), instead having numerous scattered small spines. The hexagon does not include a central spine in *S. hawaiiensis* while a single strong median spine is present in both *S. milneedwardsi* and *S. rogeri*. *Sternostylus milneedwardsi* has not been reported since Henderson's reports on the H.M.S. *Challenger* voyage (Henderson 1885, 1888) and the type material was not examined here. Baba (2005) separated the two species using the level of dilation of the cornea (strongly dilated in *S. milneedwardsi* and somewhat dilated in *S. rogeri*) and the spination of abdominal tergite 1 (one row of spines in *S. milneedwardsi* and two rows in in *S. rogeri*). Additionally, the flexor margin of the Mxp3 merus bears a granule or spine in *S. milneedwardsi* but is smooth in *S. rogeri* (Fig. 229B). Also, Henderson (1888: pl. 20 fig. 2b) shows a median row of three pairs of spines on thoracic Sternite 4, somewhat similar to what has been reported for *S. cavimurus*. *Sternostylus rogeri* bears two or three pairs of spines on sternite 4 but these are never arranged in a close sequence as shown for *S. milneedwardsi* and *S. cavimurus* (Fig. 230C). A pair of large spines is typically situated at a posterior position (between the coxa of P2), a pair of small spines situated anterior to these may or may not be apparent and one pair of small or distinct spines at the anterior position (between the coxa of cheliped). The type material of *S. milneedwardsi* needs to be re-examined to determine the validity of these characters and, with the only record for this species remaining in southern Chile, a comparison using DNA sequence analysis might provide some interesting insights into diversification patterns of these southern latitudes.

DNA sequence data. Intraspecific sequence divergences for partial CO1 gene: 0.7% (two specimens, NIWA 14598, pcl 32.0, and 26449, pcl 9.8 mm). Interspecific levels of divergences: 14.0–14.3% (*S. niwa* **sp. nov**.), 17.3% (*S. formosus*, Genbank accession number KF051393, Roterman *et al*. 2013).

Discussion

Prior to this study, only 21 species from two of the four families of the Chirostyloidea were reported and/or described for the New Zealand region. A further 18 had been listed in published species inventories but had not been documented in detail. Here, the first comprehensive monographic account for the New Zealand Chirostyloidea is provided, bringing the fauna to 86 species in three families and eight genera. Twenty-six of these are new to science and 23 are records new to the region.

The only family that is not present in New Zealand waters is the Kiwaidae, the yeti crabs. *Kiwa araonae* Lee, Lee & Won, 2016 was recently described from the Australian-Antarctic Ridge between New Zealand and the Antarctic continent, but all other known kiwaids are widely dispersed along the eastern Pacific vent and seep systems and the Southern Ocean spreading ridge and fracture zones (Roterman *et al.* 2018). The hydrothermally inactive Macquarie Ridge and the New Zealand continental mass may have provided an effective barrier to dispersal for the kiwaids, since they have not been reported in New Zealand vents and/or seeps or the chemosynthetic habitats located along the central and northern New Zealand continental margin.

On current evidence, about half (46%) of the known New Zealand chirostyloid fauna is endemic. Slightly fewer species (40%) are more widespread tropical western Pacific species and they are nearly entirely restricted to the northern ridges and seamounts of the study area. Four species (5%) were originally described from southern Australia and they represent a southern temperate element that does not extend further north than ~35°S (such as *Uroptychus cardus* and *Sternostylus rogeri*). Five other species span both tropical and temperate latitudes (e.g. *U. australis*, *U. raymondi*, or *U. inaequalis*). Some species are extremely widely distributed throughout the Indo-West Pacific, e.g. *U. alcocki*, *U. nigricapillis*, or *U. remotispinatus*. More detailed studies of these species across their ranges are required to establish whether they might represent a species complex. On the one hand, chirostylids have typically been found to be highly range-restricted due to their specific habitat preferences and larval characteristics (Rowden *et al.* 2011, Schnabel *et al.* 2011); however, while Poore & Andreakis (2011) found *Uroptychus naso* van Dam, 1933 to represent a species complex that included two new species, their genetic study indicated that *U. naso sensu stricto* retained a wide distribution from Japan to Western Australia with only limited genetic divergence. Nevertheless, a general biogeographic pattern emerges here of a dominant tropical fauna in the northern New Zealand region giving way to a strongly endemic element around the New Zealand continental margin that includes a shared southern Australian fauna in the south. At the same time, the species diversity shows a sharp latitudinal cline with a peak of nearly 60 species just north of New Zealand (30–35°S) and then a steady decrease to four species known in the Subantarctic waters south of 50°S.

A clear pattern observed in the chirostyloid fauna examined is that most of the species are incredibly rare, a tendency that has been observed elsewhere, and for example, has recently been discussed by Poore *et al.* (2014) for the crustacean fauna collected off western Australia. Here, only 18 species have been collected at ≥ 10 stations, with the common *Gastroptychus novaezelandiae* most abundant (85 stations). In contrast, 44 species, more than half, have only been collected once in the entire region. This is most certainly a sampling artefact, given the scarcity of collections in the New Zealand region overall, particularly at depths off the continental margin (Gordon *et al.* 2010). This is compounded by the fact that nearly all the chirostyloids appear to occur on underwater features like seamounts and other areas with rocky substrates and that these are only sporadically distributed around the region. One notable example of a nearly entirely unstudied area is the Colville Ridge that runs to the west of the Kermadec Ridge, the samples from which were collected by the 2012 NIRVANA voyage (TAN1213). A total of four stations provided the only records of *U. cylindropus*, *U. longior*, *U. numerosus,* and *U. vulcanus* for the region as well as *U. nirvana* **sp. nov.** Despite efforts to replicate some collections in some cases, e.g. the Challenger Centenary Cruise in 1974 and the 2016 Kermadec-Rangitahua voyages that covered the same area and depth as the H.M.S. *Challenger* stations off the Kermadec Islands, the apparently rare species, *U. paku*, *U. kaitara*, *U. rutua*, *U. webberi,* and *U. yaldwyni*, described by Schnabel (2009) were not collected again.

Several other species are only known from their respective holotypes collected in the early to mid-20th century (e.g. *U. novaezealandiae* Borradaile, 1916, *U. proberti* **sp. nov.**, *U. taranaki* **sp. nov.**, or *U. tasmani* **sp. nov.**). An intriguing case is also *U. ahyongi* **sp. nov.**, the species with the highest number of specimens sampled (>300), nearly all from the Bay of Plenty (Fig. 27). Nearly all specimens of *U. ahyongi* **sp. nov.** were collected before early 1998 but only one further sample is available from 2000 in the same region. This area has been intensively fished for the New Zealand scampi *Metanephrops challengeri* (Balss, 1914) and regular fisheries surveys in the area return bycatch for identification (Tuck *et al.* 2016). The absence of further specimens of *U. ahyongi* **sp. nov.** from this area, despite abundant previous collections, is noteworthy. Even though much remains unknown about the true distribution and abundances of many species reported herein, their association with other macroinvertebrates such as corals will leave these squat lobsters vulnerable to human impacts such as trawling and mining.

Several taxonomic questions remain to be addressed; these include a review of *Eumunida australis* and clarification of whether the specimens identified here as *Eumunida* cf. *sternomaculata* might indeed be referable to *E. australis*. Additionally, further research is required to determine whether the material presented as *Eumunida* sp. represents a new species.

Higher than expected genetic distances singled out specimens of *Uroptychus remotispinatus*, *U. spinirostris,* and *U. thermalis,* and notable morphological variation cast doubt on the identity of one specimen treated as *U. torrancei* **sp. nov.** Further investigations are required to resolve whether these putative species might each represent more than one species. The specimen presented as *Heteroptychus* cf. *claudeae* most likely belongs to an undescribed species, based on DNA sequence divergence levels, but the genus still requires some additional research in order to identify stable diagnostic characters for species diagnosis; this specimen remains intriguing. Also, the material presented as *U.* cf. *longvae* requires detailed examination and ideally, DNA barcoding, alongside the Australian *U. longvae sensu stricto* to verify whether they are conspecific. Finally, a specimen of *Chirostylus* cf. *dolichopus* (presently only known from a photograph taken by SCUBA off Raoul Island) remains to be captured. Overall, the current morphological species designations and recent identification key of Baba (2018) match the results of DNA sequence data in most cases.

Supplementation of the morphological descriptions with molecular data has highlighted the presence of several species that might have otherwise gone undetected; these include *Uroptychus havre* **sp. nov.**, *U. aotearoa* **sp. nov.**, *U. nieli* **sp. nov.**, and *U. nirvana* **sp. nov.** For both *U. aotearoa* **sp. nov.** and *U. nieli* **sp. nov.,** it appears that they are most closely related to species from across the Tasman Sea (*U. bardi* and *U. flindersi*, respectively). The mechanisms by which the other two species, *U. havre* **sp. nov.** and *U. nirvana* **sp. nov.**, might have diverged are unclear; *U. havre* **sp. nov.** is most closely related to *U. thermalis,* and both species co-occur on the Kermadec Ridge, while *U. nirvana* **sp. nov.** does not appear to be closely related to its morphologically most similar species *U. maori*, but morphological similarities are probably convergent.

Other trans-Tasman species show high sequence-similarity, indicating that there is gene flow across the Tasman Sea: *Uroptychus raymondi*, *U. defayeae*, *U. litosus*, *Sternostylus rogeri* (N. Andreakis, unpubl.), and this variability of divergences between such closely related species within the same genus might be worth investigating more closely in the future. Comparing levels of CO1 sequence divergence between trans-Tasman populations of three species of *Munida* squat lobsters, Yan *et al.* (2020) concluded that sufficient levels of gene flow between Tasmania and New Zealand are present to justify treating the populations as panmictic in all cases. For other taxa, and using other genetic markers, gene flow could be shown across the Tasman, e.g. for the crayfish *Jasus edwardsii* (Hutton, 1875) (Thomas & Bell 2013) and for the cup coral *Desmophyllum dianthus* (Esper, 1794) (Miller *et al.* 2011). In both studies, however, it was also apparent that some populations were connected (e.g. the shallow-water populations across the Tasman for the coral, and the New Zealand and Tasmanian populations for the crayfish) while breaks to gene flow were identified between depth strata (corals) and between New Zealand and the Great Australian Bight populations west of Tasmania (crayfish). These patterns were attributed to localised water currents that contribute to the differential retention of larvae and larvae rarely moving between these water masses. Larval characteristics and duration differ in all these taxa, which emphasises the need for caution when comparing one specimen from Australia with one specimen from New Zealand without considering the respective location and depth. Unfortunately, there is currently little scope for a wider study due to the scarcity of suitable material across wide distribution ranges for chirostyloid squat lobsters.

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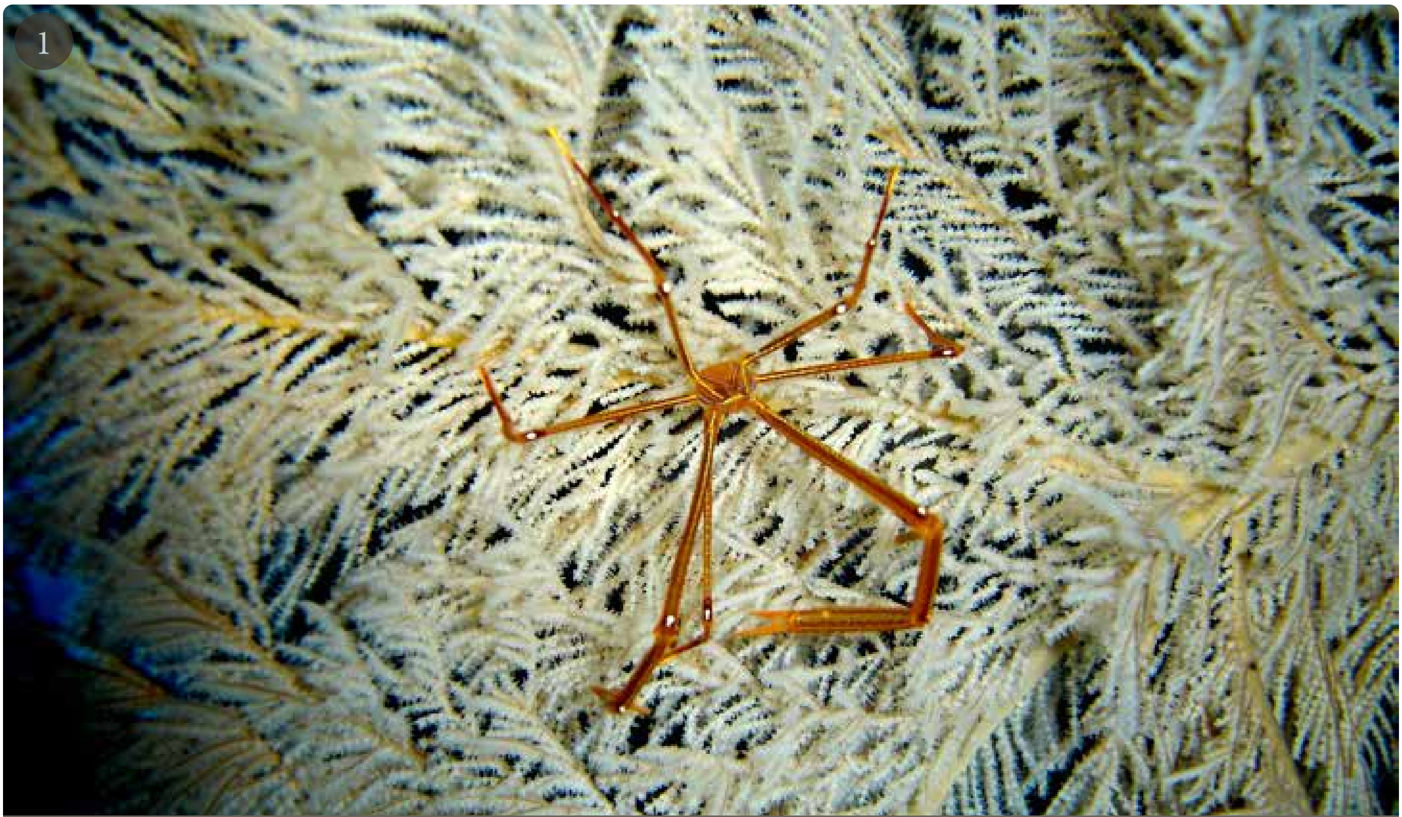
Pseudomunida fragilis, a member of the family Eumunididae, are often bright orange to pink, and typically large (>10 cm). The long, slender chelipeds are always held forward. This specimen is visible behind a gorgonian fan. Collected and photographed by GEOMAR ROV *KIEL 6000* onboard RV *Sonne* (ICBM expedition SO254, NIWA 90215).

SEAFLOOR IMAGES

Seafloor images of living squat lobsters

With increasing use of NIWA's DTIS (Deep Towed Imaging System) onboard RV *Tangaroa*, and other seafloor imaging tools such as Remotely Operated Vehicles (ROV) and submersibles operated off visiting international vessels, there is a critical need to provide accurate identifications from images only.

While we may be able to improve our accuracy by examining specimens taken from the same stations, an element of doubt remains as to the identity of invertebrate species using images only, especially if they do not have any obvious diagnostic morphological characters that facilitate determination at the species level. The identifications provided here are the most accurate possible, based upon best knowledge of the species featured in this study. Unless otherwise indicated, all images are provided courtesy of NIWA.



unconfirmed

Chirostylus cf. *dolichopus*

The genus is characterised by the extremely long pereopods and absence of a distinct rostrum. The bright triangular-shaped banding on the carapace is typical

Image taken by Clinton Duffy on SCUBA at Meyer Islands, Kermadec Islands, at a depth of about 20–30 m.

confirmed

Gastroptychus novaezelandiae (NIWA 127128)

Characterised by the extremely long pereopods and distinct red-and-white banding pattern on the walking legs. Perched on a carnivorous sponge, probably *Asbestopluma* (body length is 16 mm)

RV *Sonne* Stn SO254/34ROV09 (BIOBOX7), collected and photographed by ROV *KIEL 6000*, GEOMAR expedition SO254, aboard RV *Sonne*, 37°30.11'S, 178°46.27'E, north of Gisborne, 535.5 m, 08 Feb 2017, PoriBacNewZ Stn SO254_34ROV09, image courtesy of ROV *KIEL 6000* GEOMAR, PoriBacNewZ ICBM

3

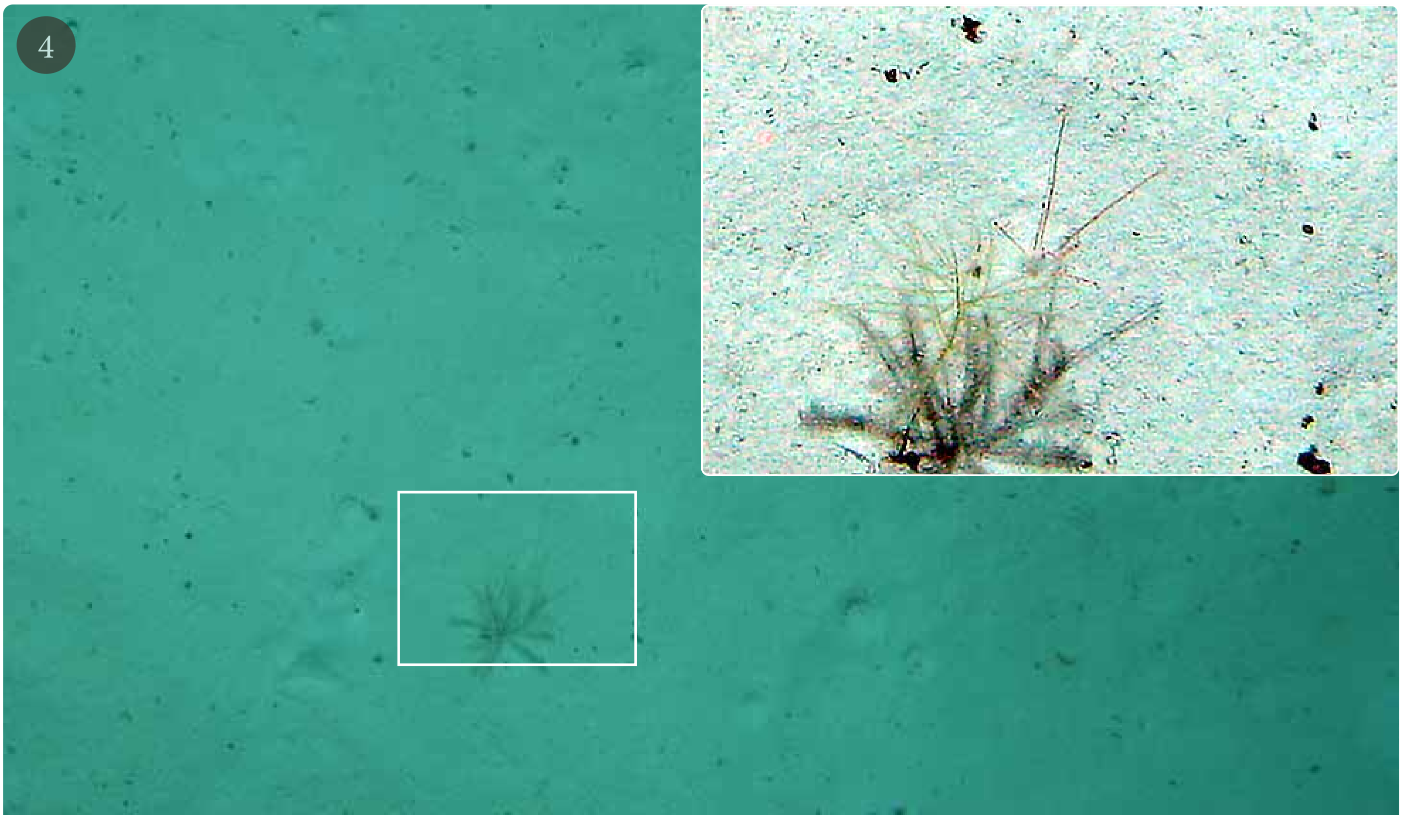
Gastroptychus novaezelandiae

most likely

This species is very common on the Chatham Rise and is characterised by the extremely long pereopods. Here, it is perched on a small bamboo coral; the body is barely visible but the shadow in the strobe of the DTIS camera sled gives it away (body length about 10 mm, distance between the tips of the chelipeds is about 70 mm)

NIWA Stn TAN0705/115, Chatham Rise, 44.00°S, 175.27°W, 418 m, 12 Apr 2007

4

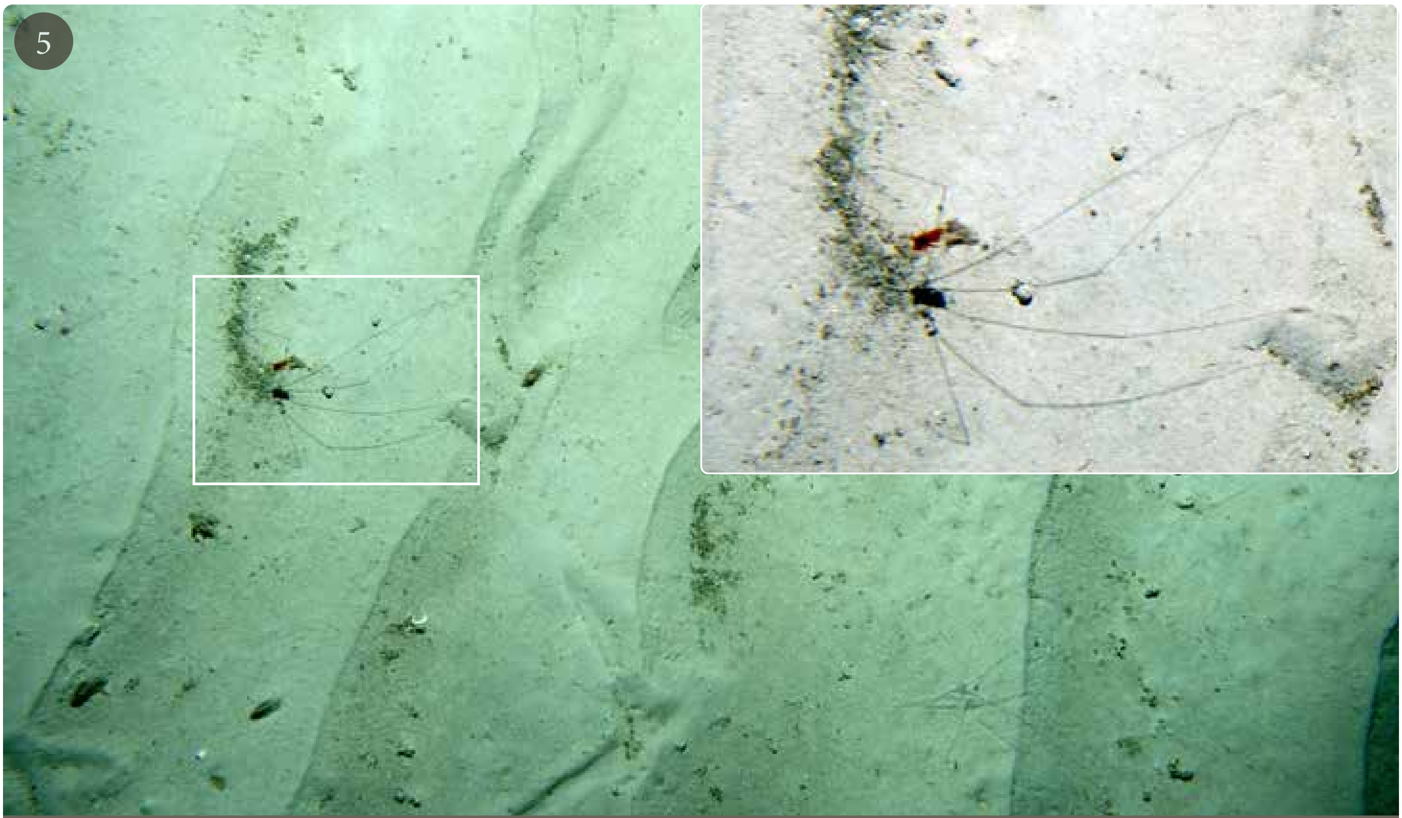


Gastroptychus novaezelandiae

most likely

This species is very common on the soft sediments of the continental shelf and characterised by the extremely long pereopods. This specimen is perched on a hydroid (length of each cheliped is about 60 mm)

NIWA Stn TAN0707/89, Challenger Rise, 39°05.32'S, 169°20.97'E, 530 m, 4 Jun 2007

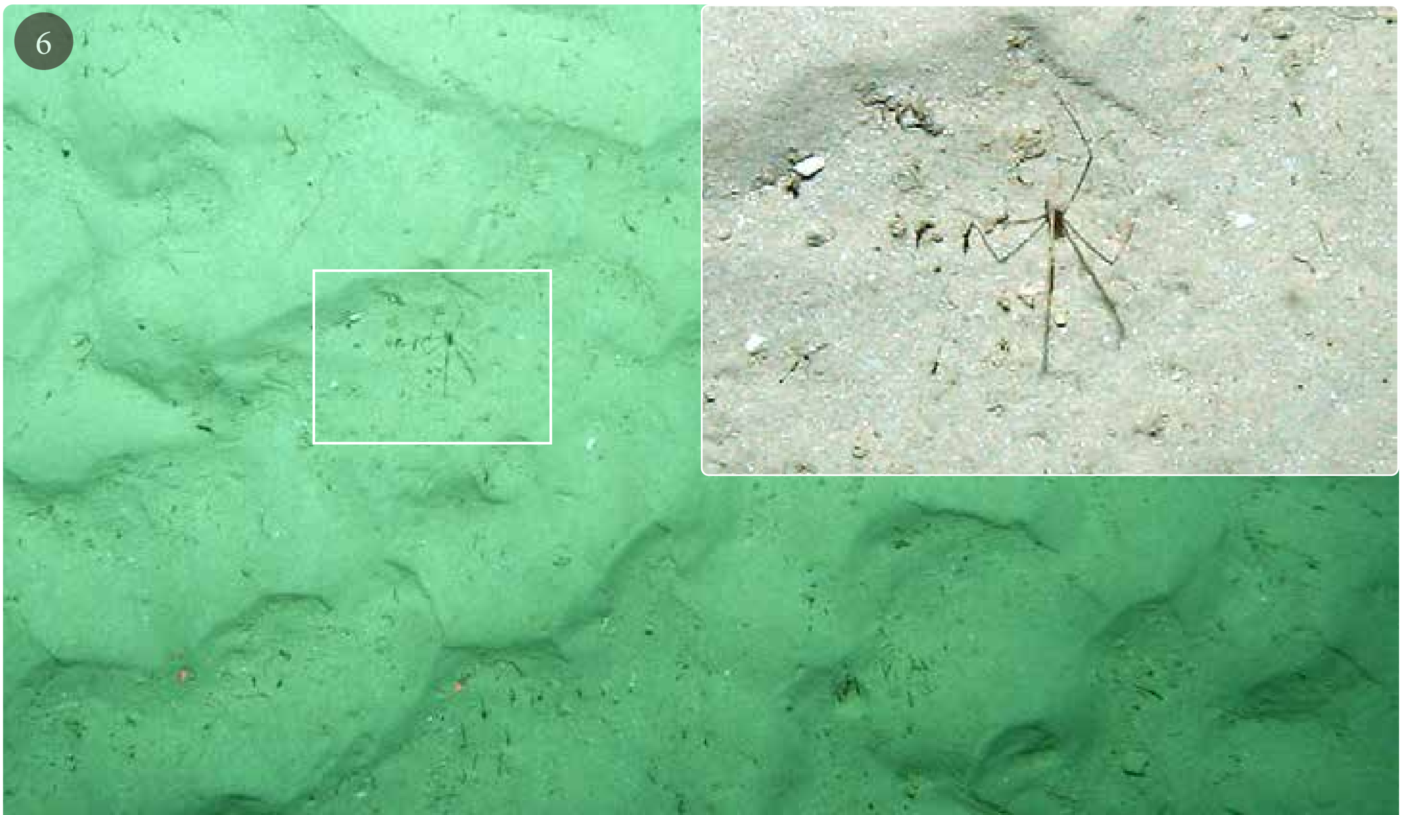


most likely

Gastroptychus novaezelandiae

Characterised by the extremely long pereopods and often perched on small corals or hydroids (chelipeds are about 130 mm long)

NIWA Stn TAN1402/125, Ghost Seamount, Louisville Ridge, 40°46.39'S, 165°17.92'E, 1011–1375 m, 25 Feb 2014

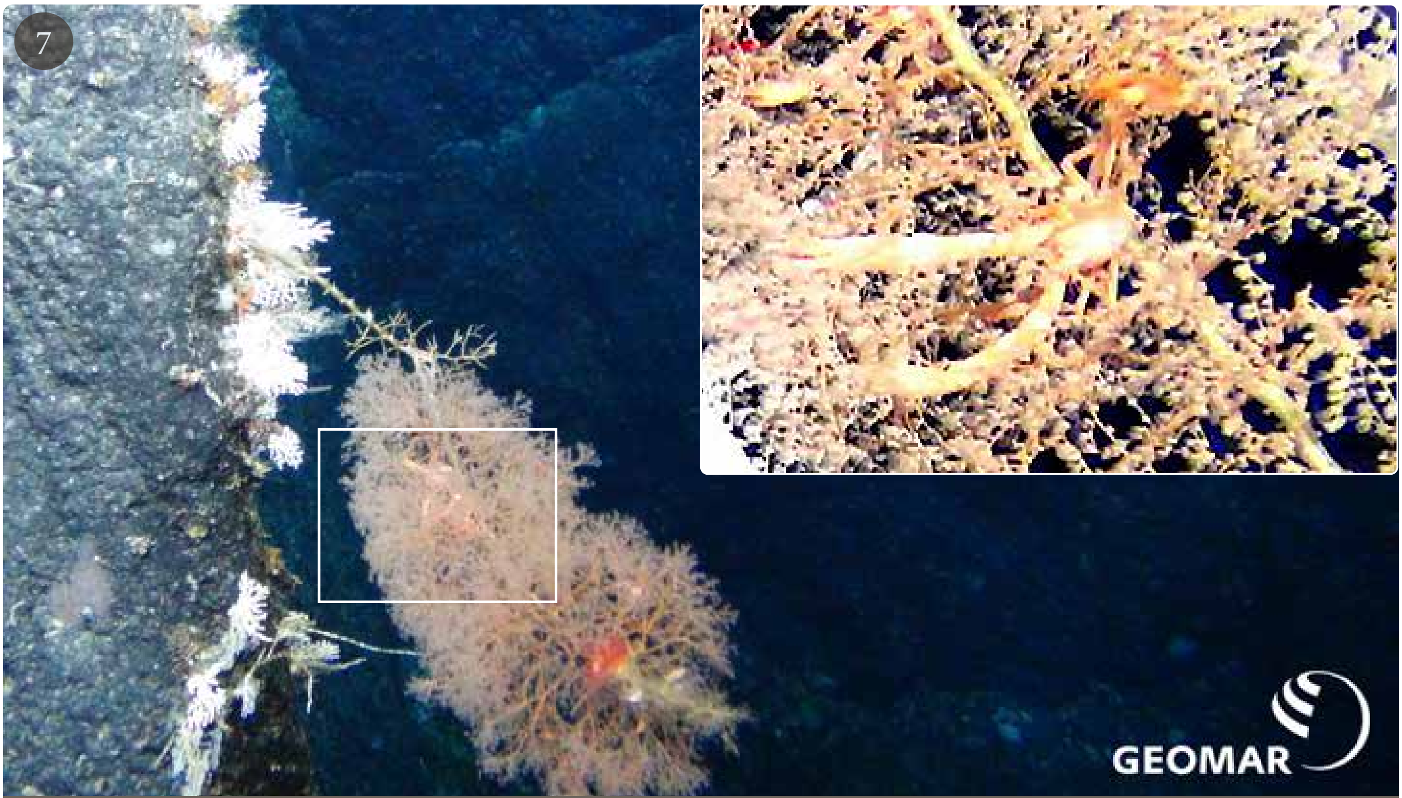


most likely

Gastroptychus novaezelandiae

Characterised by the extremely long pereopods and this species is very common on the Chatham Rise (width of body including legs, about 5 cm).

NIWA Stn TAN0705/115, Chatham Rise, 44.00°S, 175.27°W, 418 m, 12 Apr 2007

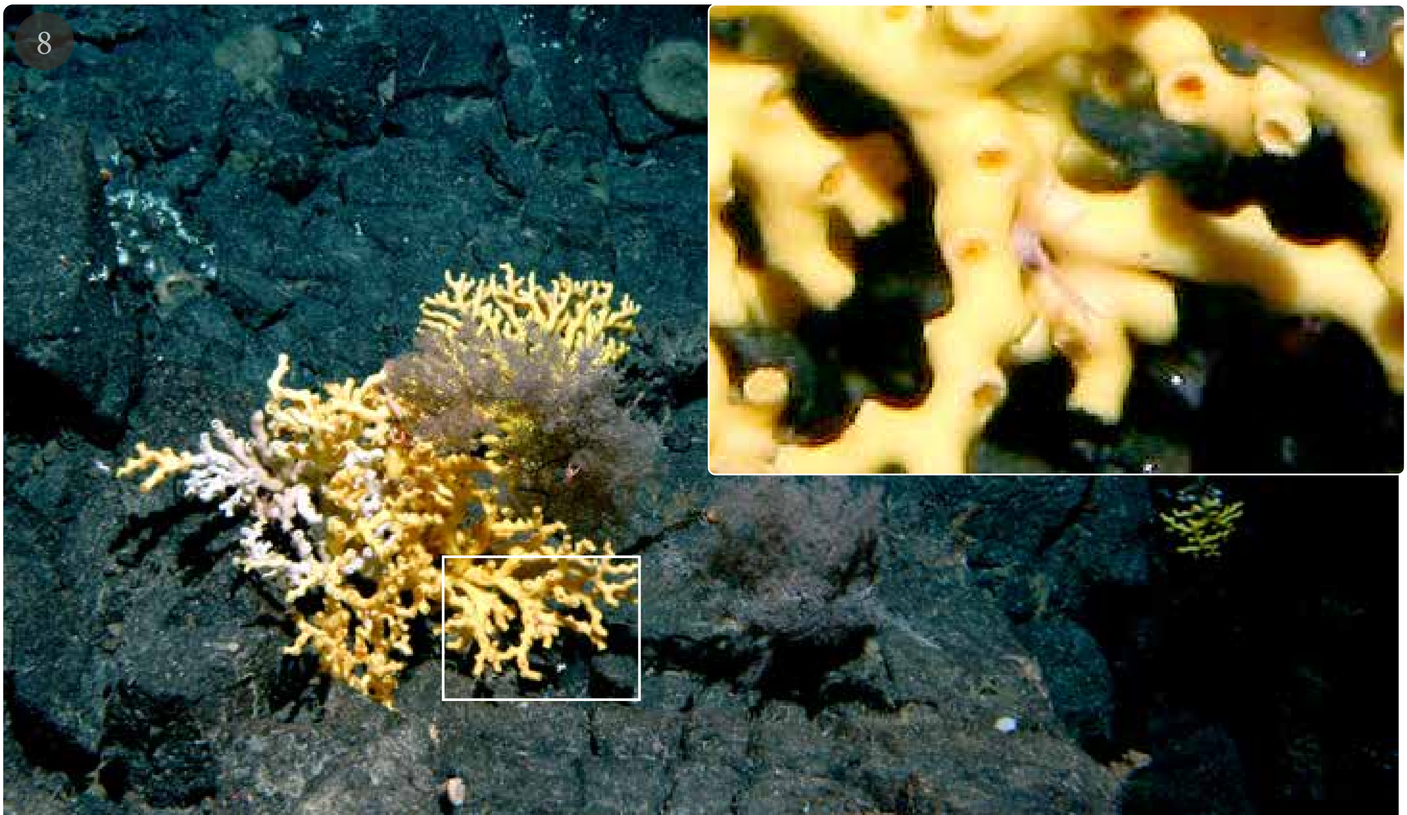


confirmed

Uroptychus litosus (NIWA 127112)

Members of the genus *Uroptychus* are difficult to identify from *in situ* images, nearly all species are light pink to beige in color, with slender pereopods and typically robust chelipeds. Many species appear to be associated with octocorals and antipatharians. Here collected on *Chrysogorgia* sp.

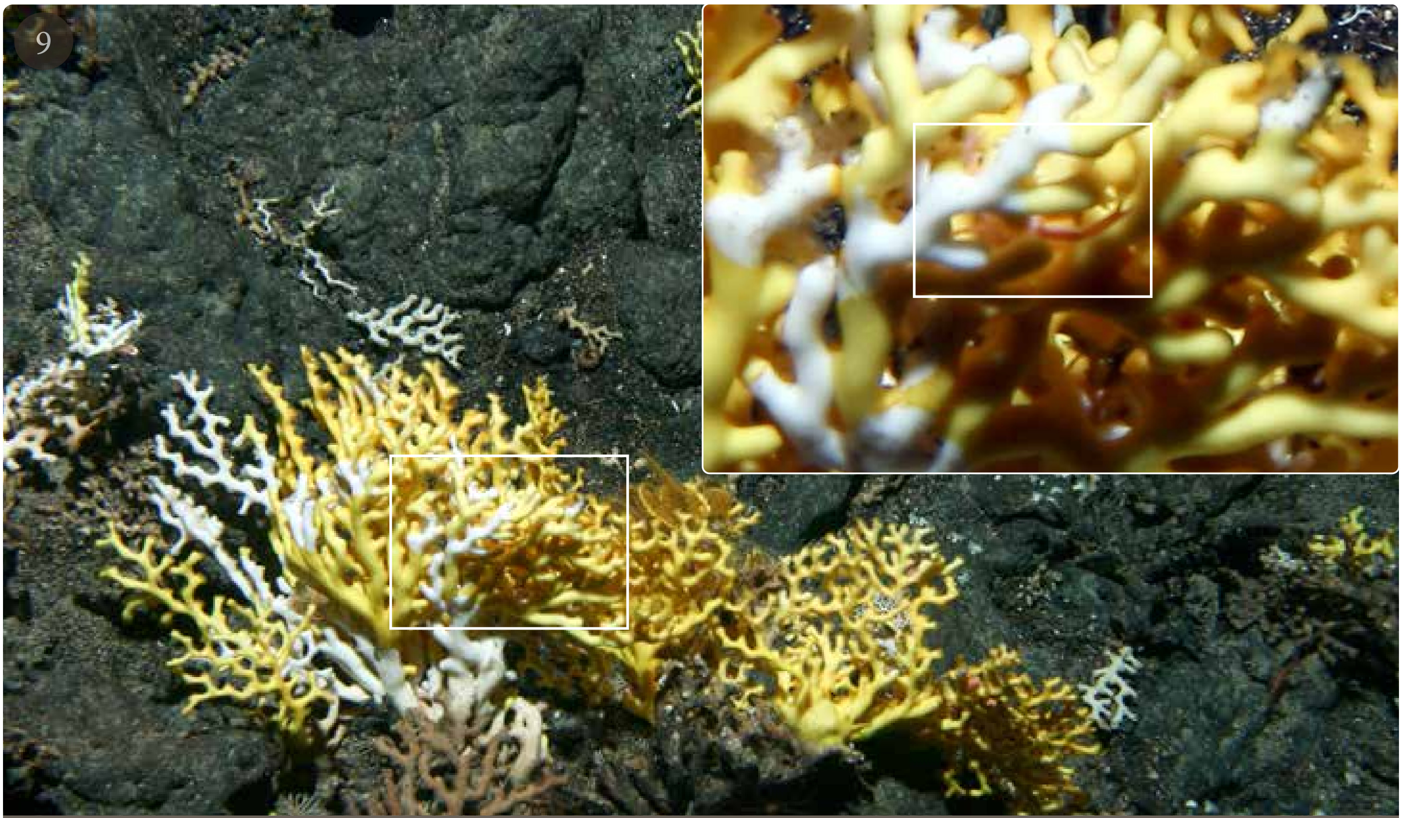
RV *Sonne* Stn SO254/33ROV08 (BIOBOX14), Southern Kermadec Ridge, collected and photographed by ROV *KIEL 6000*, GEOMAR expedition SO254, 35.382°S, 178.979°E, 1216.8 m, 07 Feb 2017, image courtesy of ROV *KIEL 6000* GEOMAR, PoriBacNewZ ICBM



Uroptychus sp.

Cryptic squat lobster, probably *Uroptychus*, among branches of *Enallopsammia rostrata* hard coral (length of pereopod about 10 mm)

NIWA Stn TAN1206/92, Clark Seamount, Bay of Plenty, 36.45°S, 177.84°E, 916–860 m, 24 Apr 2012

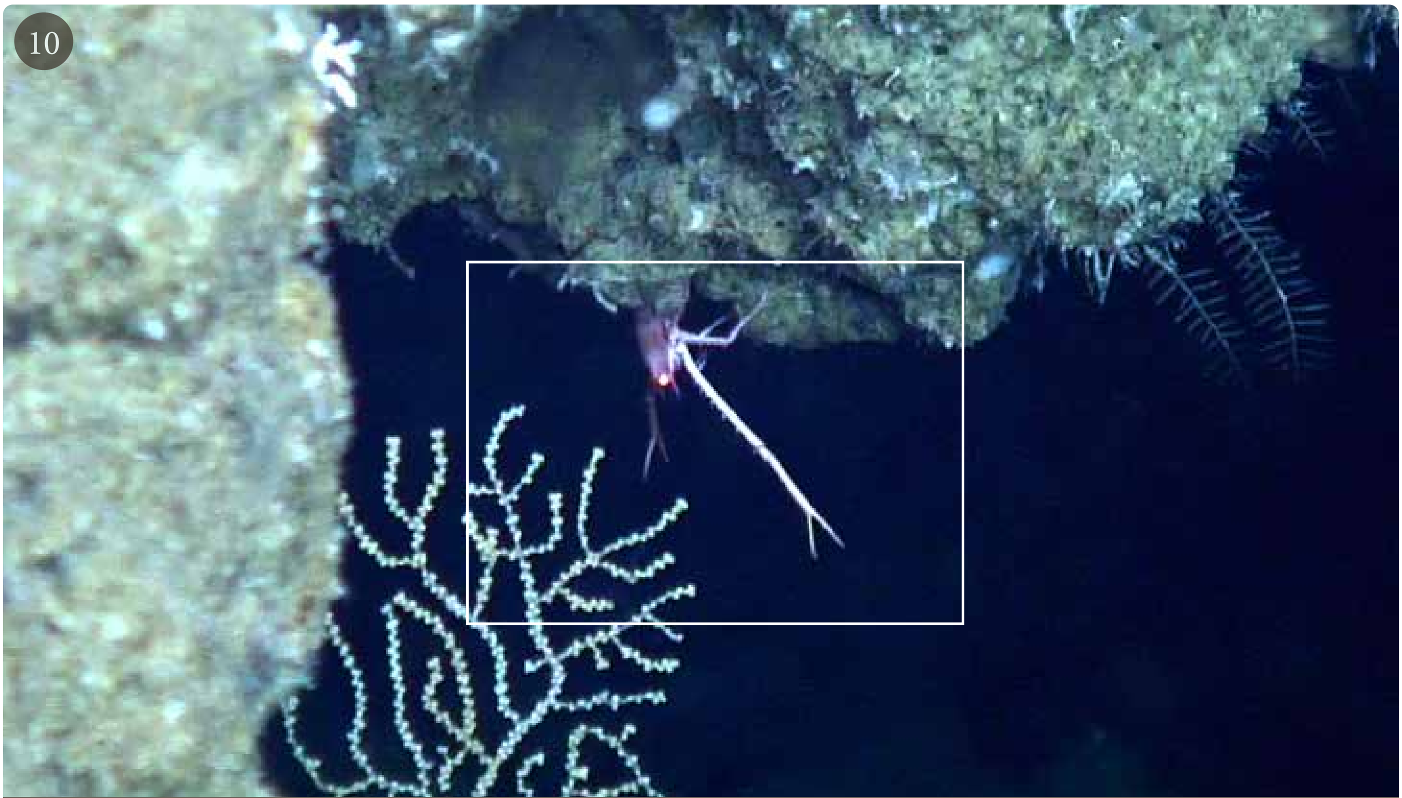


unconfirmed

Uroptychus sp.

Cryptic squat lobster, possibly the same as in image 8, *Uroptychus* sp. among branches of *Enallopsammia rostrata* hard coral (pereopods are 10 mm long)

NIWA Stn TAN1206/98, Clark Seamount, Bay of Plenty, 36.45 °S, 177.84 °E, 916–860 m, 24 Apr 2012



Eumunida sp. (NIWA 90215)

confirmed

The genus (and family) is characterised by the large body and long cheliped that show distinct spines along the inner margin, and the stance (the carpi of the chelipeds are short and the chelipeds are typically held in a horizontal plane in front of the animal). The animal is seen here clinging to a rock ledge overhanging a colony of gorgonian fan coral (?Plexauridae)

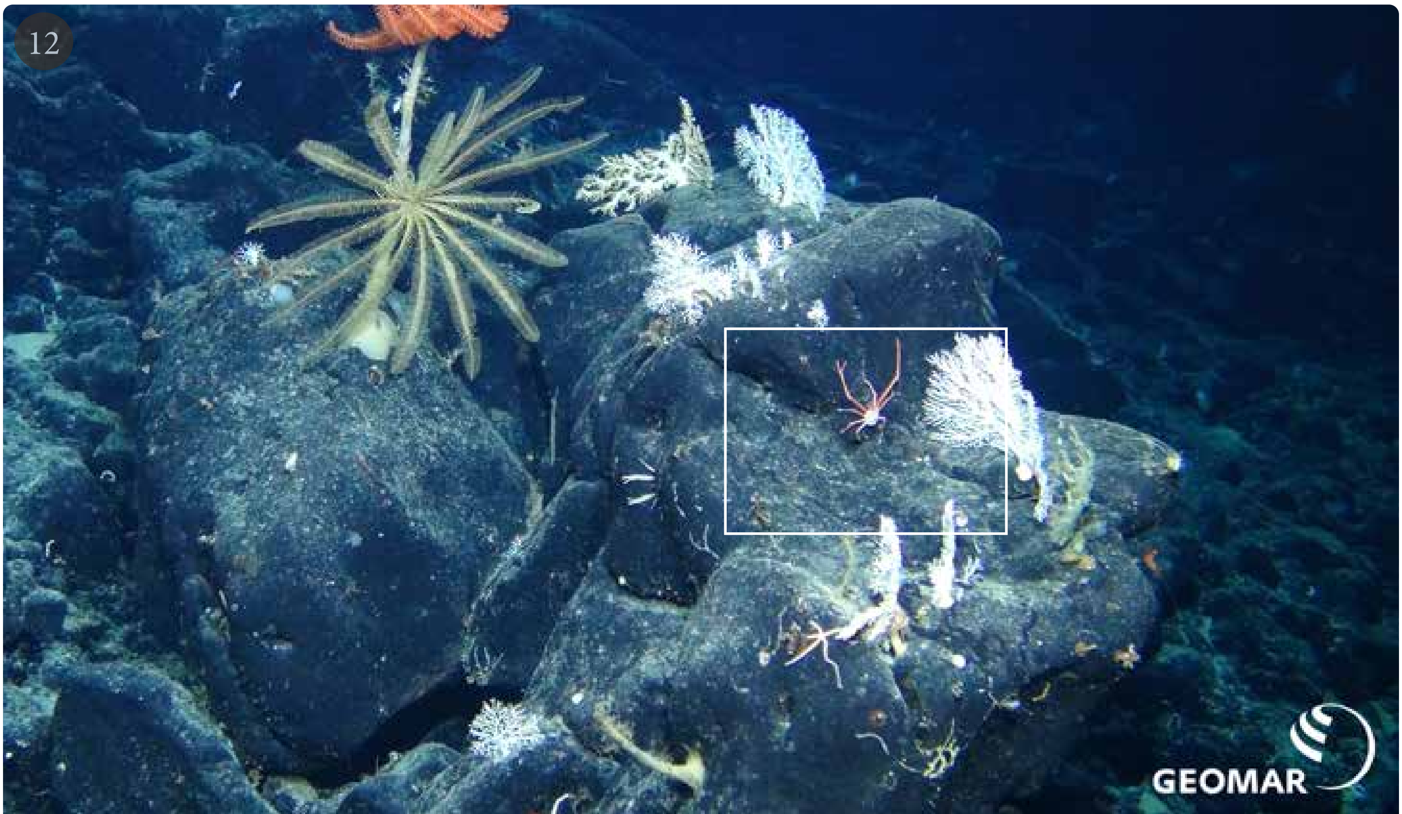
JAMSTEC submersible *Shinkai* Stn YOK1311/1374/25, 26 ° 24.12'S, 177 ° 14.64'W, Hinepuia Volcano, 499 m, 30 Oct 2013. Image courtesy of submersible *Shinkai* 6500 JAMSTEC.

Pseudomunida fragilis (NIWA 90215)

confirmed

The members of the family Eumunididae are often bright orange to pink, and typically large (~10–20 cm from the tip of the cheliped to the telson). The very long and slender chelipeds are held forward to form a diamond shape. The two genera in the family are easily distinguished by the number of supraocular spines if a closeup view is possible. Visible here on the right, behind the gorgonian (*Callogorgia*) fan, shortly before it was collected by the ROV *KIEL 6000*

RV *Sonne* SO254/08ROV02 (BIOBOX19), Seamount No. 114, East of Three Kings Ridge, collected and photographed by ROV *KIEL 6000*, GEOMAR expedition SO254, aboard RV *Sonne*, 31.30°S, 175.20°E, 1143.7 m, 31 Jan 2017, image courtesy of ROV *KIEL 6000* GEOMAR, PoriBacNewZ ICBM



Pseudomunida fragilis

unconfirmed

The members of the family Eumunididae are often bright orange to pink, and typically large (~10–20 cm from the tip of the cheliped to the telson). The very long and slender chelipeds are often held forward to form a diamond shape.

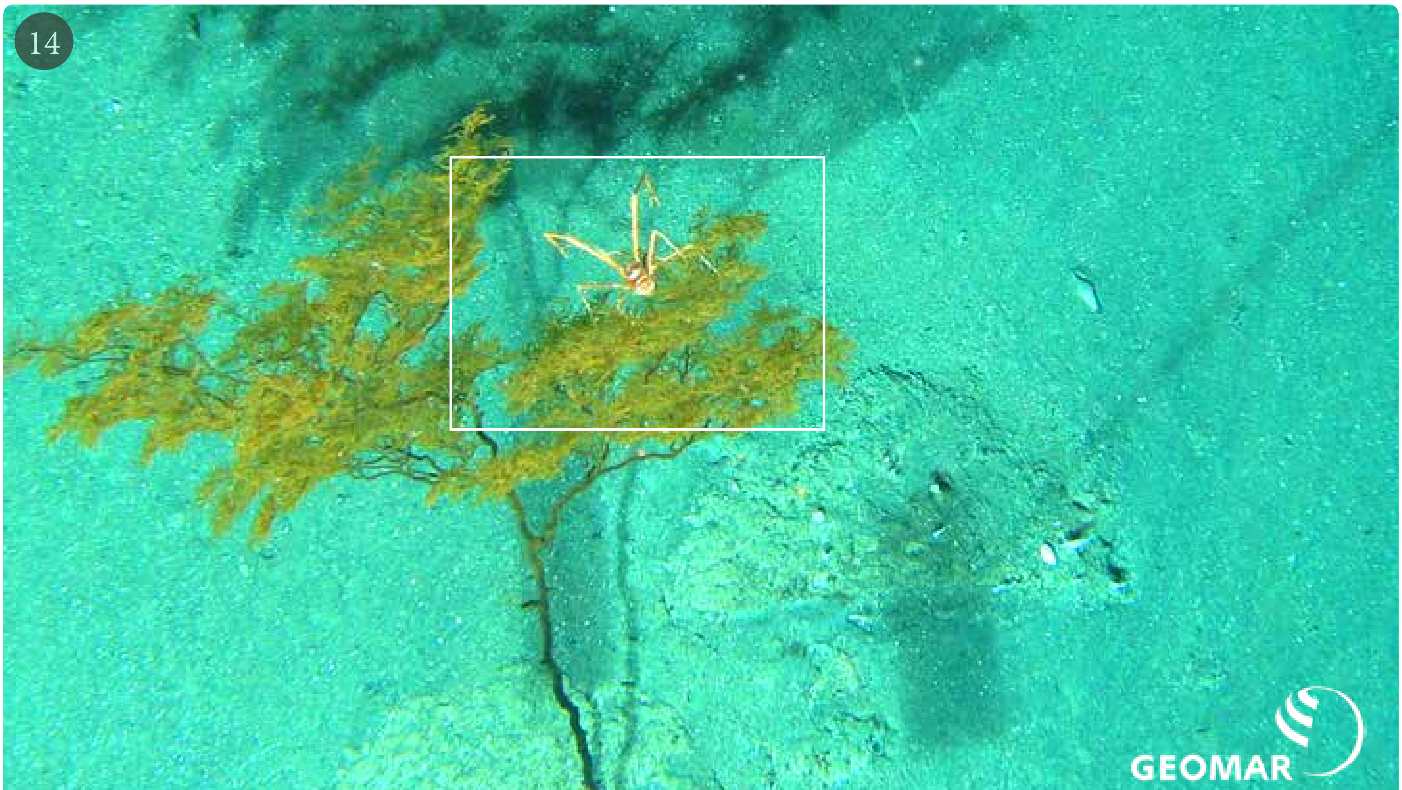
RV *Sonne* SO254/08ROV02 (BIOBOX19), Seamount No. 114, East of Three Kings Ridge, collected and photographed by ROV *KIEL 6000*, GEOMAR expedition SO254, aboard RV *Sonne*, 31.30°S, 175.20°E, 1143.7 m, 31 Jan 2017, image courtesy of ROV *KIEL 6000* GEOMAR, PoriBacNewZ ICBM

Sternostylus rogeri (football crab)

unconfirmed

Characterised by large body (animals measuring up to 30 cm from the tip of the cheliped to the telson) and distinct red and white stripes on carapace. Seen here perched on a large bubblegum coral, *Paragorgia*, among a beautiful array of hard corals and sponges

NIWA Stn TAN0905/56, Ghoul Seamount, Chatham Rise, 42.80 °S, 179.99 °E, 1055–1010 m, 19 Jun 2009

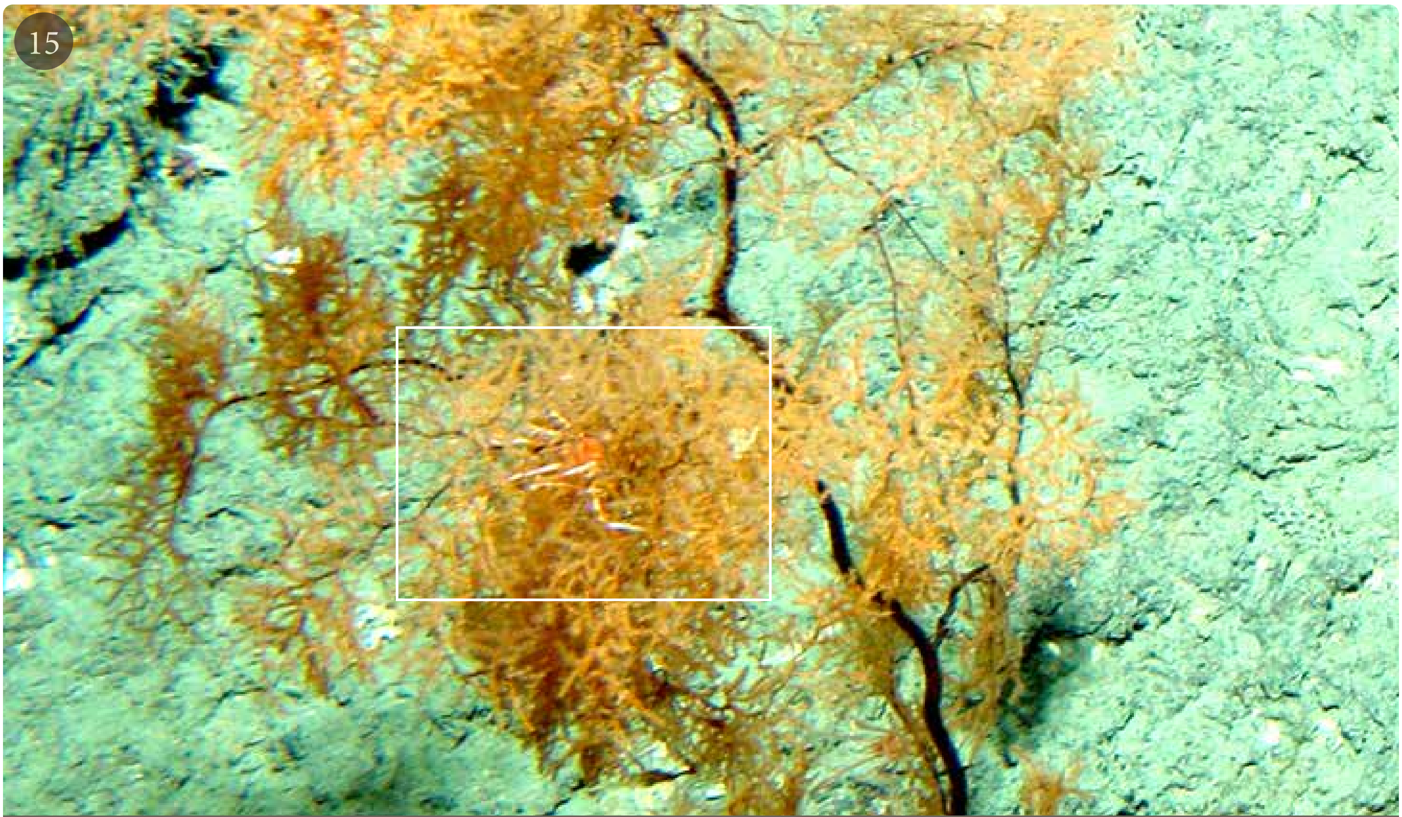


Sternostylus rogeri (football crab)

unconfirmed

Characterised by large body (animals measuring up to 30 cm from the tip of the cheliped to the telson) and distinct red and white stripes on carapace. Note the stance (the long carpi of the chelipeds allow the animals of this genus to hold the fingers downwards. Compare with *Pseudomunida*). Seen here perched on a solitary *Leiopathes* black coral at 'Builder's Pencil', Hikurangi Margin.

RV *Sonne* Stn SO191/199_OFOS20, Builder's Pencil, Hikurangi Margin, 39.52 °S, 178.33 °E, 825–803 m, 01 Mar 2007. Image courtesy of NEW VENTS, IFM GEOMAR.

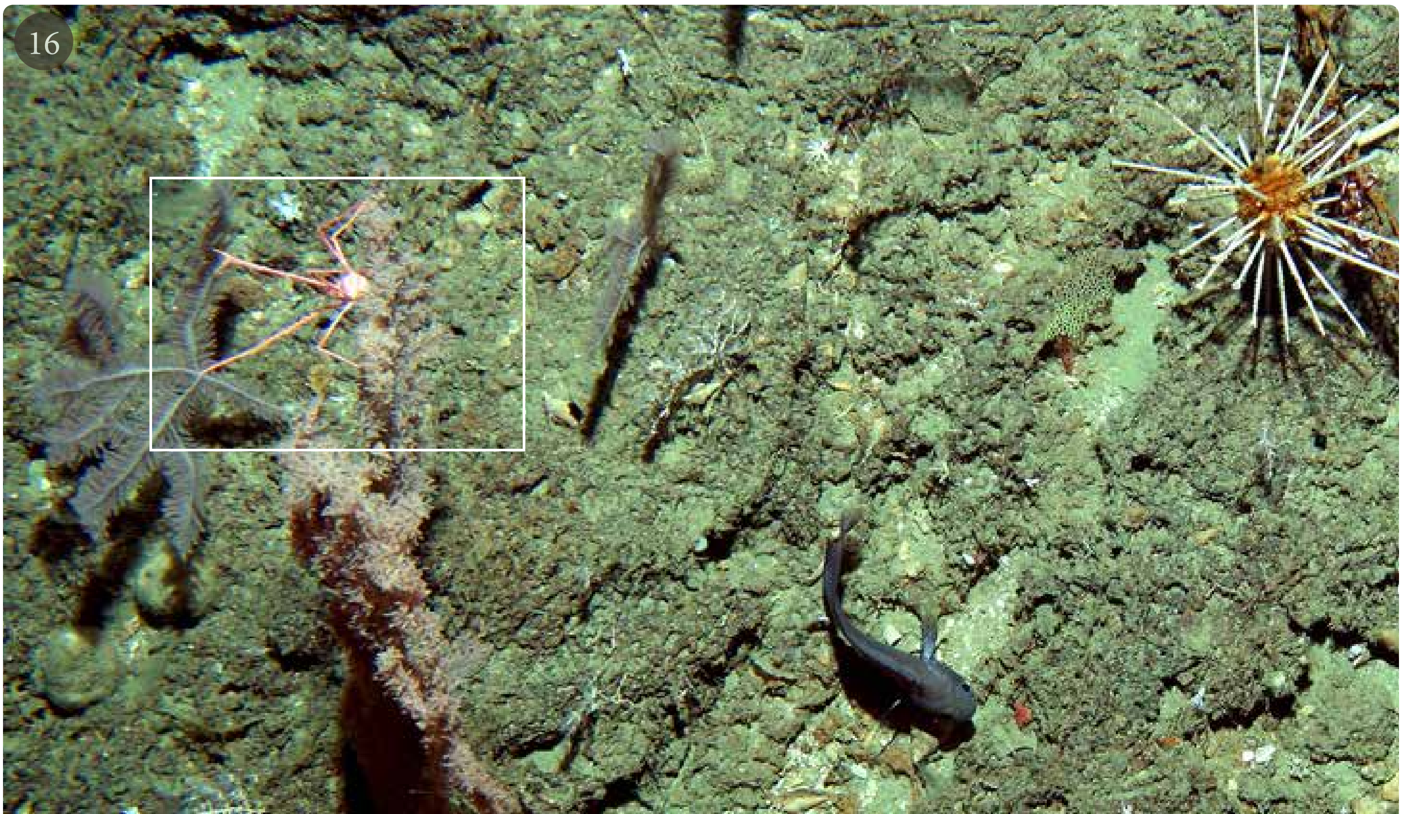


Sternostylus sp.

most likely

Probably *Sternostylus rogeri*. Characterised by large body and striped carapace. Typically associated with large corals, seen here perched on a large *Leiopathes secunda* black coral

NIWA Stn TAN0616/66, Southern Uruti Ridge, Hikurangi Margin, 41.30°S, 176.55°E, 792–787 m, 10 Nov 2006



Sternostylus sp.

most likely

Probably *S. rogeri*. Characterised by large body and striped carapace. Typically associated with large corals, seen here perched on a large black coral.

NIWA Stn TAN0616/66, Southern Uruti Ridge, 41.30°S, 176.55°E, 792–787 m, 10 Nov 2006

Taxonomic index

Principal taxonomic account is in bold font; species illustrations in bold italic.
A checklist of New Zealand species is given on pages 24–25.

NIWA Biodiversity Memoir 132
ISSN 1174-0043; 132 (print)
ISSN 2463-638X; 132 (online)

Soft cover	ISBN 978-0-473-52183-7
Hard cover	ISBN 978-0-473-52184-4
Electronic	ISBN 978-0-473-52185-1